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EDUCATIONAL MEASUREMENTS



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EDUCATIONAL MEASUREMENTS

BY

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"EXPERIMENTS IN EDUCATIONAL PSYCHOLOGY"

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EDUCATIONAL MEASUREMENTS

CHAPTER I

INTRODUCTION

It is undoubtedly premature to write a book on educational measurements, because most of the measurements are in the experimental stage. There are, however, several reasons which more than offset this situation. In the first place, the need of definite, objective measures of educational products is so great and the usefulness of the present available standard tests has been so generally demonstrated that a means of making the tests and scales more widely accessible is entirely justifiable. Second, the very fact that many of the tests are in the experimental stage is a reason for making them more generally available, so that they may be rectified, improved and extended through broader coöperation of educators over the entire country. Third, it is hoped that more general application of educational measurements will create a deeper scientific interest in educational matters.

The current movement for measuring school products is one of the three or four most important fields of investigation in the scientific study of educational problems. Very material progress has been made during the last half a dozen years in the endeavor to devise accurate methods for measuring the actual achievements of pupils in school studies, so that we now have fairly accurate tests and scales for measuring attainment in most of the elementary schools studies and in several high school subjects.

It is unnecessary to point out the scientific and practical value of such investigations for all who are connected with the schools — administrators, supervisors, teachers, pupils and students of educational problems. These tests will furnish tools for evaluating quantitatively the results of methods and factors in teaching and

learning, and for examining various aspects of efficiency of instruction and administration of school systems.

It is unnecessary to make a defense of educational measurements in the presence of intelligent persons who have a genuine scientific interest in the education of mankind. There are those who say that the real results of education are too subtle and too evasive to be measurable by any sort of quantitative tests. The only reply to offer is that we are making such measurements all the time by the millions of school marks assigned every year and by all the comparative judgments of human qualities as better or worse, as greater or less, as more useful or less useful, which we are so free to make not only in educational affairs but in all phases of human activity.

The sole purpose of standardized measurements is to refine these judgments, to make them more accurate and objective, to express them in terms of known units of a definable character, so that we may be able to say, for example, that a pupil can read three words per second of a certain passage and to report so and so much of it, that he knows the English meaning of 2000 Latin words and can translate without error sentences of specified difficulty.

If there are any products or by-products of education which are too subtle to be distinguished or judged as existing in greater or less amounts, or as having higher or lower quality, we may be suspicious of their actual existence. Any quality or ability of human nature that is detectable is also measurable. It remains only to discover more and more accurate means of measurement.

What we need more than anything else in teaching and in the administration of public schools is scientific method and caution in handling the problems confronted. Educators must instill into themselves the scientific point of view in looking at their problems. The old-time pedagogy is passing away; quantitative studies, objective measurements, and carefully observed facts are taking its place. The next great forward step in education will come when competent educators will use the schools as laboratories for legitimate experimentation conducted according to scientific procedure.

CHAPTER II

MARKS AS MEASURES OF SCHOOL WORK

MARKS are the universal measures of school work. Numerous and momentous problems in the operation of a school depend upon them, such as promotion, retardation, elimination, honors, eligibility for contests and societies, graduation, admission to higher institutions, recommendations for future positions and the like. Until a decade ago, no one questioned either the validity or the fairness of these measurements. It was tacitly assumed that marks were almost absolutely correct, or very nearly so, a fact attested by the surprisingly common practice of marking to the fractional part of a point even on a 100 percentage basis.

If we consider marks from a scientific viewpoint as a measuring scale, three fundamental questions arise: (1) How fine a scale of units may be used satisfactorily? (2) How reliable are the ratings made on the particular scale adopted? (3) How shall the marks be distributed? That is, How frequently in the long run shall each unit on the scale be assigned? The second problem will be taken up first. In order to show precisely the accuracy, or rather the inaccuracy, of marks, the following investigation will be cited.

The Reliability of Marks

The Reliability of Marks in the Case of English. The recent studies of grades have emphatically directed our attention to the wide variation and the utter absence of standards in the assignment of values. Dearborn pointed out in his investigation the large inequalities in the standards of grading employed by different teachers. Of two instructors in the same department one gave to 43 per cent of his students the grade of "excellent" and to none the grade of "failure," whereas the other gave to none of his students the grade of "excellent" and to 14 per cent the grade of "failure."

Finkelstein made a comparison of the marks assigned to the students in a course which was in charge of one instructor during the first semester and in charge of another instructor during the second semester, the students remaining the same throughout the year. The distribution of the marks was as follows:

	0-59	60-69	70-79	80-89	90-100	Exempt from ex- amina- tion
1st instructor	9.5	25.5	32.3	26.6	6.1	12.5
2d instructor	3.5	24.9	34.1	43.7	3.8	37.7

Such wide differences are no doubt due in part to a difference in the students and in the nature of the work, but largely to a difference in the standards of marking.

In order to determine precisely the personal equation in evaluating the work of pupils, it is necessary to eliminate all variable elements, such as difference in amount and kind of work covered by the class, emphasis upon different topics, differences in teaching ability and differences in the pupils themselves.

An investigation was made to determine the range of variation and the reliability of the marks assigned by different teachers to the same papers. Two examination-answer papers, written by two pupils at the end of the first year's work in English, in high school, were reprinted by plates, so that the handwriting, the errors and changes made by the pupils, the neatness, etc., were reproduced exactly as in the original papers. These two papers were marked carefully by one hundred and forty-two teachers of first-year English according to the practices and standards of their respective schools.

The grades assigned by the one hundred and forty-two teachers are represented by accompanying distribution charts. The range of marks is indicated along the base line of each chart and the number of times each grade was given is indicated by the number of dots above that grade. Thus in Fig. 1 grade 80 was given by five teachers and grade 81 by eight teachers. The marks for one paper, paper A, are given in Fig. 1 and those for the other paper, paper B, are given in Fig. 2.

The first and most startling fact brought out by this investigation is the tremendously wide range of variation. It is almost

shocking to a mind of no more than ordinary exactness to find that the range of marks given by different teachers to the same paper may be as large as 35 or 40 points.

Nineteen teachers marked paper A 80 or lower and fourteen

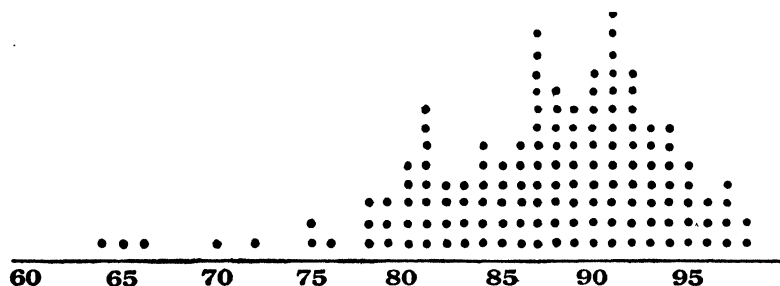


FIG. 1. — Paper A. Passing grade 75. Median 88.2. Probable error 4.0. Marks assigned by schools whose passing grade was 70 were weighted by one point since the marks assigned by teachers in schools whose passing grade was 70 were on the average one point lower.

marked it 95 or higher. Eighteen teachers marked paper B 70 or lower and fourteen marked it 90 or higher.

The two papers, A and B, were marked 80 and 75 respectively by the teacher under whom the pupils had taken the course. The passing grade in this school was 70.

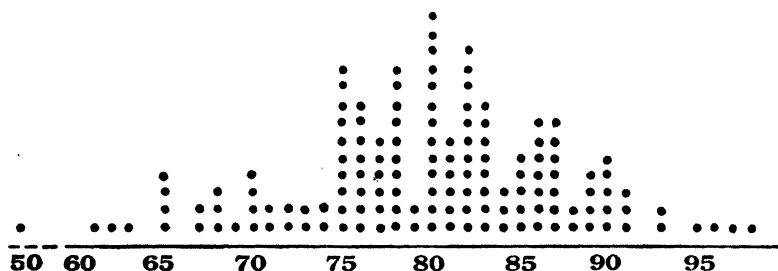


FIG. 2. — Paper B. Passing grade 75. Median 80.2. Probable error 4.8. Marks assigned by schools whose passing grade was 70 were weighted by two points since the marks assigned by teachers in schools whose passing grade was 70 were on the average two points lower.

These data have an interesting bearing upon the question of promotion and retardation. The pupil who wrote paper B, the poorer of the two, received from his teacher a mark 5 points above the passing grade, whereas twenty-two out of the one hundred and forty-two teachers did not give a passing grade to this pupil. The

promotion or retardation of a pupil depends to a considerable extent upon the subjective estimate of his teacher.

The probable error of the grades is approximately 4.5. This means that the individual marks deviate on the average 4.5 points from the median or average of the entire group of marks. The fact of such a large probable error shows the absurdity of marking to the fractional part of one point, as was done in quite a number of papers. One paper was even graded as fine as 79.9. The probability is that at best any one teacher's mark is 5 points from the true mark, if the average mark given by a large number of teachers may be regarded as a true mark. A truer way of indicating the mark of a paper would be 80 plus or minus 5, to show that the chances are even that the mark is within 5 points of being correct.



FIG. 3. — Passing grade 75. Marks assigned by schools whose passing grade was 70 were weighted by 3 points. Median 70. Probable error 7.5.

The Reliability of Marks in the Case of Mathematics. It has been urged that marks in language work must necessarily vary considerably because of the personal and subjective factors involved, and that the situation is very different in an exact science such as mathematics. An investigation, similar to the one with the English paper, was made with a geometry paper which had been written as a final examination by a pupil in a high school.

This paper was graded by 118 teachers of mathematics yielding a distribution of marks as exhibited in Fig. 3. There is a current assumption that a mathematical paper can be graded with mathematical precision. This investigation shows that the marks of this particular geometry paper varied even more widely than the marks of the English papers. The probable error of the geometry marks

was 7.5, whereas the probable error of the *English marks* was 4.0 and 4.8 respectively.

A little analysis, however, will show the absurdity of assuming greater precision in evaluating a mathematical paper than in evaluating a language or any other kind of paper. While it is true that there can be no difference of opinion as to the correctness of a demonstration or of the solution of a problem, yet there are various ways in which a demonstration may be worked out, involving the succession of the steps, the use of theorems and definitions, the neatness of the drawings and, most of all, the relative value of each particular demonstration, definition, step or error in the evaluation of the paper as a whole. Obviously the complication of factors is as intricate in one sort of paper as in another.

It is therefore evident that there is no inherent reason why a mathematical paper should be capable of more precise evaluation than any other kind of paper. In fact, the greater certainty of correctness or incorrectness of a mathematical demonstration or definition may even contribute slightly to the wider variability of the marks, because the strict marker would have less occasion to give the pupil the benefit of the doubt.

Further tabulation of the results also demonstrated that the marks given to the answer for a single question of the paper varied as widely as those given to the paper as a whole.

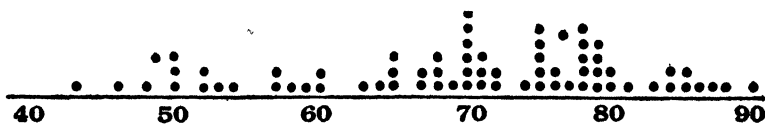


FIG. 4. — Marks assigned to a history paper by seventy teachers.

Reliability of Marks in the Case of History. An investigation conducted in exactly the same manner as the two preceding ones was made with a final examination paper in United States History. The marks assigned by seventy teachers of history are shown in Fig. 4. The distribution of these marks is very similar to that found for the English and mathematics papers. The extreme range extends from 43 to 92, with a probable error of 7.7.

The chief results of these investigations are that the marks as-

signed to the same paper by different teachers vary enormously and that the variability or unreliability of marks is as great in one subject as in another. Contrary to current belief, grades in mathematics are as unreliable as grades in language or in history.

The immense variability of marks tends obviously to cast considerable discredit upon the fairness and accuracy of our present methods of evaluating the quality of work in school. No matter how much any one may wish to minimize the utility of marks, they have, nevertheless, an indispensable administrative value from the standpoint of the school, and a real personal value from the standpoint of the pupil.

Factors Producing the Variability of Marks. How are such wide ranges of differences to be explained? Four major factors enter into the situation: (1) Differences among the standards of different schools, (2) Differences among the standards of different teachers, (3) Differences in the relative values placed by different teachers upon various elements in a paper, and (4) Differences due to the inability to distinguish between closely allied degrees of merit.

How much of the variation is due to each factor? To determine the strength of the first factor a further study was made in which ten papers written in the final examination in freshman English at the University of Wisconsin were graded independently by ten instructors of the various sections of freshman English. An effort is made by coöperation among the instructors concerned to have as much uniformity as possible in the conduct of these sections. The same final examination is given to all. The grades thus assigned varied just as widely as those assigned by teachers in different institutions.

Another point of interest is the fact that the teachers under whom the students took the course did not succeed in grading the papers any more accurately than the other instructors who did not know the students. The mean variation of their grades was as large as that of the marks assigned by the other teachers.

There was also a very noticeable difference in the standard of grading. One instructor graded the papers on the whole thirteen points lower than the average and another instructor graded them seven points higher than the average.

After eliminating the variation in the marks due to this difference in standards among the instructors, by raising or lowering each one's marks according to the amount that each instructor's average differed from the general average, it was found that the variability was smaller, though not as much smaller as one might anticipate. The mean variation was reduced only 1 point, from 5.3 to 4.3.

The next step was to separate the third and fourth factors. That is, how much of the variation is due to the inability to distinguish between closely allied degrees of merit and how much is due to differences in relative values placed by different instructors upon various aspects of a given paper, such as form, neatness, clearness, etc.

The accuracy of distinctions between various shades of merit was ascertained by having the same persons give two evaluations to the same papers separated by sufficiently long intervals of time so that the details and identity of the papers had been forgotten.

By having seven instructors regrade each a set of his own papers, it was found that the mean variation was reduced to 2.2 points. In several instances the second mark differed as much as ten or fifteen points from the first mark.

The mathematics instructors did not agree any more closely with their own marks than the language or science instructors. We may eliminate one further factor, namely, the difference due to a change in an instructor's standard after an interval of time. This was done by weighting the second set of marks by the difference between the averages of the two markings. This reduced the mean variation to 1.75 points.

Of the four factors stated at the outset, each contributes the following amount to the total variation: The general mean variation or probable error of grades assigned by teachers in different schools was 5.4 points. The mean variation of grades assigned by teachers in the same department and institution was 5.3. The mean variation of the latter, after eliminating the effect of high or low personal standards was 4.3. The mean variation of grades assigned at different times by the same teachers to their own papers was 2.2. Hence the largest factors were the second, third and fourth. The fourth contributed 2.2 points, the third 2.1 points, the second 1.0 point and the

first practically nothing toward the total of 5.4 points of mean variation.

The Fineness of the Marking Scale

How small divisions on a marking scale are practically usable? As a matter of psychological methodology, the units of any scale of measurements, if a single measurement with the scale is to have objective validity, should be of such a size that three fourths of all the measurements of the same quantity shall fall within the limits of one division of the scale. For example, if the marks assigned by 75 out of 100 teachers to a given paper lie between 80 and 90, then the unit of our scale should be ten points. Any smaller division would have little or no objective significance. Of course, almost indefinitely small differences in merit can be measured if an indefinite number of independent estimates is made.

Now what are the actual facts with regard to the size of distinguishable steps in the marking scale? We have seen above that the mean variation of the estimates of a teacher in matching his own marks, after eliminating his own change in standard, is 1.75 points. According to the principle that if a unit is to be large enough in range to include three fourths of all his estimates of the same quantity, then the smallest distinguishable step that can be used with reasonable validity is $2\frac{3}{4}$ times the mean variation (1.75) or probable error, which would be 4.8, or roughly 5 points.¹

Hence our marking scale, instead of being 100, 99, 98, 97, 96, 95, etc., should be 100, 95, 90, 85, 80, etc. These are the smallest divisions that can be used with reasonable confidence by a teacher in grading his own pupils. This means that on a scale of passing grades of 70 to 100 only seven division points are distinguishable. This substantially confirms the scheme followed in many institutions that the marking scale should be A +, A -, B +, B -, C +, C -, D +, D - and failure. Letters or symbols are perhaps preferable to such designations as Excellent, Good, Fair and Poor because of the moral implication in the latter.

¹ To those who may be interested in the basis of this computation I may say that a range twice the size of the probable error includes one half of the series of estimates, and a range 2.8 times the mean variation or 3.4 times the probable error includes approximately three fourths of the series of estimates. In practice the mean variation and the probable error are used interchangeably, but the former is usually a trifle larger than the latter.

Even as fine a scale as this might perhaps better be replaced by a coarser one computed on the mean variation of 4.3 points, which is the mean variation of different teachers in the same department and institution after the effect of the personal standard has been eliminated. On this basis the range of a division on the scale should be 4.3 times $2\frac{3}{4}$, or approximately 12 points. The reason for this larger step would be that this is as closely as 75 out of 100 competent teachers agree on the evaluation of the same papers. One teacher may be as much in the right for grading a paper 80 as another for grading it 90. The only ultimate criterion is the consensus or average of estimates. This coarser scale would allow for only three divisions of passing grades, A, B and C. But the finer scale proposed above can be used with reasonable accuracy by a teacher in grading his own pupils in the light of his own viewpoint.

Of course, any one may use as fine a scale as one pleases provided one recognizes the range of the probable error of the scale used. The fine scale, if conscientiously used, probably tends to stimulate the making of finer distinctions than a coarse scale does. However, the chief objections to a very fine scale are: (1) An illusion of accuracy, (2) injustice to the student of supposed differences where no differences actually exist or where the relative merit may be just reversed, (3) embarrassment to the teacher due to this injustice.

If we admit the soundness of our reasoning, it may seem to many teachers that a scale of five steps is rather crude and that the evaluation of a pupil's attainment is very coarse. As a matter of fact, the steps of the proposed scale are reasonably fine.

Apropos of this point a comparison was made with measurements of a similar type in an entirely different field by having a group of carpenters estimate by visual impression the lengths of rods. A mechanic through constant use has acquired a fairly definite mental image of an inch or a foot. Yet a mechanic's estimate of the length of a rod is not an iota more accurate than a teacher's estimate of an examination paper.

If we are attempting to evaluate a paper by a scale of 100, 99, 98, 97, 96, 95, etc., we are attempting to make finer distinctions than we are capable of. The mind does not discriminate with any degree of certainty by a single judgment between a paper of grade 85 and

another one of grade 86. If the second is appreciably better it more likely ought to have a grade of 90. Such small distinctions would have validity only if a set of papers were graded by ten teachers or by the same teacher ten times. The situation is analogous to estimating the width of a room in inches when it should be estimated in feet. Estimates in terms of large units, of course, do not have greater absolute accuracy, but they will have greater uniformity.

The Distribution of Marks

The viewpoint which will be maintained here is that marks on the whole and for large groups of pupils of usual ability should be distributed with a reasonably close conformity to the normal, bell-shaped, probability curve. The chief reasons for this principle are that physical traits, such as height, length of arms, girth of head, are distributed in accordance with the probability curve; that mental functions of which accurate measurements have been made are also distributed in this fashion; and that marks assigned by many teachers to the same pupils approximate closely to this distribution. There are, however, three factors which tend to disturb this distribution of ability: elimination of the poorer pupils as they pass from grade to grade, the raising of the performance of pupils by good teaching and the lowering of their performance because of a lack of maximum effort. The third factor counteracts the first and the second. Lack of maximum effort tends to push the marks down. Elimination of the poorer pupils tends to push them up. The most important factor is elimination. But so far as we have any definite facts about this matter, the effect of elimination in disturbing conformity to the curve is much less than is commonly supposed. The effect of elimination is not so much a disturbance of the shape of the curve as a contraction of the range of the distribution. The elimination of pupils is not a cutting off at a definite point of the curve, but rather a smooth shaving off along the entire range. It is certain that, on the whole, marks will be assigned much more justly if they are assigned with reasonably close conformity to the probability distribution, than if no heed is given to it and every teacher allowed to follow his own inclination. Large deviations should occur only when genuine reasons exist.

The form of the probability curve is indicated in Fig. 5 which also shows the distribution of approximately 5000 grades assigned to freshmen in the University of Wisconsin. The conformity of these grades to the normal curve is very close.

The adoption of a uniform scale of grades as well as a uniform standard in the frequency with which the different grades should be assigned, is a pressing need. These ends could be attained by adopting a scale of five steps, with finer subgradations, if desired, and by having each teacher and each institution compare the frequency of the various grades assigned with the theoretical frequency. Then an A + or a B - would have more nearly the same significance under different teachers and in different institutions than they have at the present time.

The practical situation which needs to be attacked is the possibility of bringing about greater uniformity both among schools and among teachers within the same school. Several things could be done in any school to bring this about. One is to make

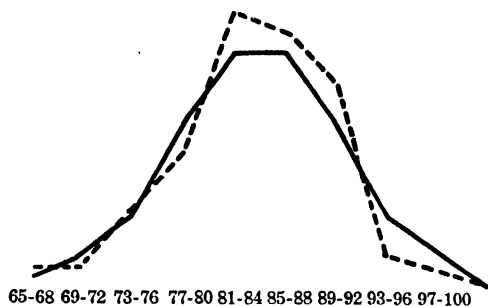


FIG. 5. — The continuous line represents the probability curve, and the dotted line represents the distribution of 5000 marks in the University of Wisconsin.

a study of the marks as actually assigned by the different teachers in a school, to tabulate them and to discuss them in a meeting of the teaching staff. This, in itself, is a wholesome thing to do. It will correct many of the gross differences without special advice or request. Second, in departments composed of several teachers, it would be well to determine by consensus of opinion upon some common plan of marking certain types of work and certain types of errors. Third, the marks could be distributed, with certain allowances for personal judgment and common-sense variation, either according to the normal probability distribution or according to some distribution agreed upon by the teaching staff of the school.

A recent experiment shows that this third suggestion will actually be efficacious in producing greater agreement in the marks given to

the same pieces of work by different judges. A set of twenty-four compositions on the subject of "Roads," written by sixth- and seventh-grade pupils, was marked by twenty-three teachers according to the usual percentage scale with 70 as the passing mark. Each teacher was then instructed to shift or change his marks into terms of a five-step scale, Poor, Inferior, Medium, Superior and Excellent, so that two out of the twenty-four papers would be marked Poor, four to six Inferior, eight to ten Medium, four to six Superior and two Excellent. They were asked to force their marks to conform to this distribution so that even if they felt, for example, that no paper was good enough to be rated Excellent they should pick out the most likely candidates.

The variability of the second set of marks, distributed by compulsion according to the probability distribution, was greatly reduced. The mean variation of the original marks was 4.2 and that of the adjusted marks, reduced to numerical terms, was 2.8. The variability of the original marks was unusually low, possibly because this experiment was carried out after an extensive discussion of the conditions of variability and of the theoretical distribution of marks.

The readjustment of the marks has therefore reduced the variability to nearly one half as compared with a mean variation of 5.3 and to about two thirds as compared with the mean variation of 4.2.

It might be questioned whether it was justifiable to force a rearrangement of the marks according to the suggested distribution. Several teachers protested against grading any paper in this group as excellent because they did not consider any one to be of sufficient merit. This, however, is an indication of the lack of a standard. One teacher marked one of the papers 85 and objected to giving it a grade of excellent, but he was obliged to do so, as this was in his judgment the best paper. The average grade of this paper was 92.9, showing that the mark of this teacher was low on account of a lack of common standard. The proposed distribution suggested to the teachers, which was followed in the readjustment of the marks, was entirely justifiable. This fact is shown by the averages of the original marks. These averages yield a normal distribution: Thus there were two papers out of the twenty-four whose average grades were below 72, six whose average grades were between 73 and 77, ten

between 78 and 83, four between 84 and 89 and two above 90. Even as small a class as twenty-four pupils, unless specially selected, will conform to the probability distribution to a remarkable extent. Certain deviations from a strict conformity should, of course, be permissible where there is a genuine reason for it.

On the basis of all these experimental results it would seem that the most satisfactory marking system would be a scale of five steps:

- A or Excellent, which should be assigned to approximately 7% of the pupils.
- B or Superior, which should be assigned to approximately 24% of the pupils.
- C or Average, which should be assigned to approximately 38% of the pupils.
- D or Inferior, which should be assigned to approximately 24% of the pupils.
- E or Unsatisfactory, which should be assigned to approximately 7% of the pupils.

If finer distinctions are desired, the plus or minus signs may be added.

CHAPTER III

A SAMPLE SURVEY OF THE MARKING SYSTEM IN A HIGH SCHOOL

IN order that the principles and findings discussed in the preceding chapter may actually become operative in the assignment of grades, a sample survey will be presented here as an illustration of how the marking system employed in a given school may be examined. The concrete situation is this: Here is a particular marking system in a school. Do the teachers apply it uniformly and fairly, and is the system as a whole justifiable?

In order to make a thorough examination of a marking system it is necessary to consider the three fundamental problems raised in the preceding chapter with reference to the system to be studied.

1. What is the nature of the scale employed?
2. How accurately are the marks assigned?
3. How are the marks, as assigned by each teacher, distributed?

The marking system to be examined is that of a high school of medium size. The first and second problems as to the nature and accuracy of the scale will be considered together. In this school the usual percentile system is used. The passing grade is 60 and a grade of 90 or above grants exemption from examinations. According to the findings of the preceding chapter, the scale is too finely graded. A coarser scale would be better, although this matter is not serious so long as the variability of the marks in terms of this scale is recognized.

The third point as to the distribution of the marks should answer such questions as these: How uniformly do the teachers assign the marks? How much difference is there in the standards of liberality or severity of marking among the teachers of the school? Does the rule of exemption from examinations affect the fairness of marking? These questions can best be answered by preparing a distribution

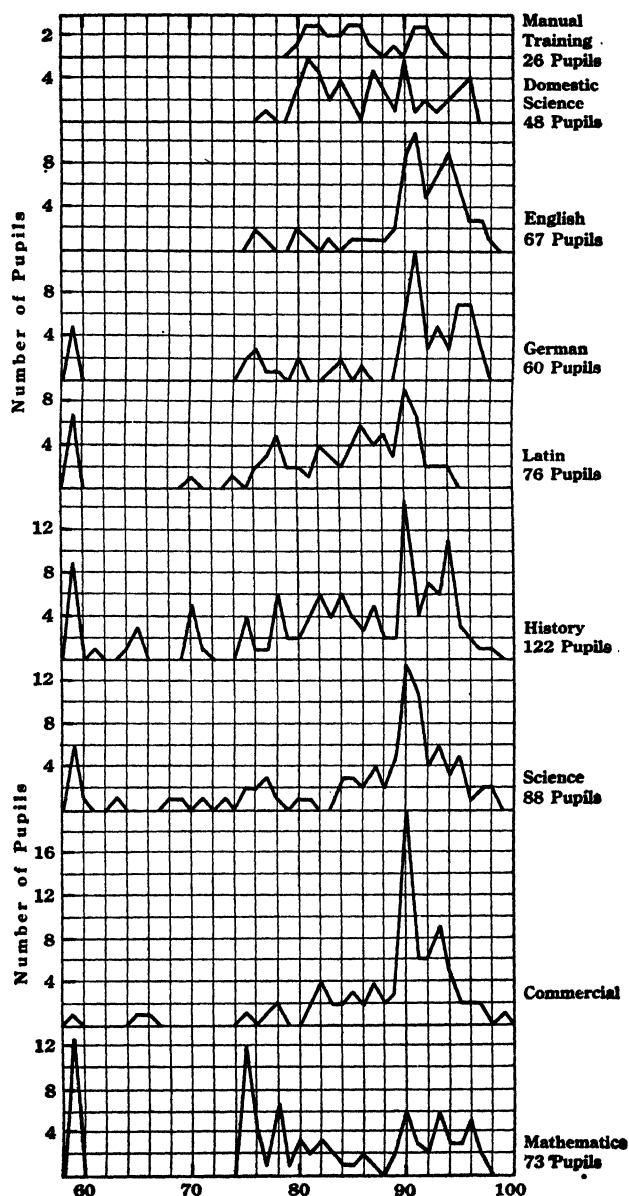


FIG. 6. — Distribution of the marks as assigned by the various teachers in a certain high school.

curve of the marks of each teacher and of the school as a whole as shown in Figs. 6 and 7.

The chief points of criticism are:

(1) The marks for the school as a whole are too high. The teachers are too liberal. In the distribution curve for the entire school, Fig. 7, 49% of the pupils received 90 or above. This curve has no resemblance or approach to the normal distribution curve discussed in the preceding chapter. On the basis of a five-step scale, A in this school would be equal to 90-99, B 80-89, C 70-79, D 60-69

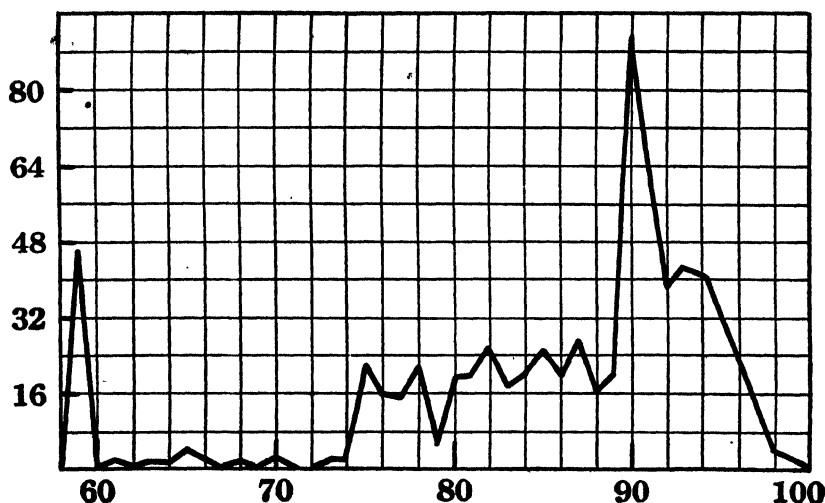


FIG. 7.—Marks assigned by the entire teaching staff of the high school. A total of 695 marks.

and E 59 or lower. According to the normal distribution, approximately 7% of the pupils should receive A. In this school, 49% received 90-99. Approximately 24% should receive B. In this school, 30% received 80-89. Approximately 38% should receive C. In this school, 12% received 70-79. Approximately 24% should receive D. In this school, 2% received 60-69. Approximately 7% should receive E. In this school, 7% received 59 or lower.

Whatever any one may hold as to the principle of distributing marks in conformity to the probability curve, it is very certain that all possible factors, which tend to destroy absolute conformity, disturb this con-

formity only to a small extent when compared with the utter absence of conformity in the marks as assigned by many teachers. It is only a reasonably close conformity with permissible deviations for genuine reasons, that is here argued for. There is no justification for the marks of the English teacher or the German teacher as contrasted with those of the mathematics teacher or even the history teacher.

(2) The rule of exempting pupils from examinations who receive a grade of 90 or above has had a pernicious effect upon nearly all teachers in raising the grades of many pupils to 90 who should not have had as high a grade. This is obviously shown by the fact that nearly every curve has a sudden rise at 90.

(3) The worst offenders in grading too liberally are the teacher in manual training, in domestic science and in English, none of whom failed any pupils or gave a grade lower than 78, although the passable grades extend down to 60.

(4) The worst offenders in giving too many grades of 90 or above are the teacher in English, the teacher in German and the teacher in commercial subjects. The English teacher gave to 80% of the pupils 90 or above, the German teacher gave to 70% of the pupils 90 or above and the commercial teacher gave to 63% of the pupils 90 or above.

(5) The mathematics teacher marked too severely as indicated by the many failures and by the numerous marks between 75 and 80.

(6) The passing grade of 60 is too low, not for any intrinsic reason, but because it makes the range of passable marks too wide. Only three teachers used the grades between 60 and 70.

Recommendations for the improvement of the marking system in this high school:

(1) The substitution of a five-step scale for the present numerical scale, or if the numerical scale is retained, the placing of the passing mark at 70 instead of 60.

(2) The abolition of the rule of exemption from examinations at 90 or above.

(3) Closer conformity in the distribution of the marks to the normal distribution.

CHAPTER IV

THE MEASUREMENT OF ABILITY IN READING

Essential Elements in Reading. Adequate measurements of any complex mental functions, such as those involved in school studies, require, first of all, an analysis of the functions into their essential constituents, and, second, the preparation of accurate tests for each of these elements. From the practical point of view, we learn to read in order to obtain information. Obviously, then, the chief elements in reading are (1) the comprehension of the material read, (2) the speed of reading, and (3) the correctness of the pronunciation, or elocution. The first two are the most important so far as reading strictly is concerned, since we learn to read for our own individual uses. For this reason, such factors as intonation, expression, pauses and the like are relatively insignificant. We use silent rather than oral reading in practical life.

Methods of Testing. The speed of reading may be measured by determining the amount of a certain kind of text that can be read in a given period of time, for example, the number of words read per second. Comprehension perhaps cannot be determined quite so easily. In the tests to be described presently the method adopted consists in reproducing the thought in writing immediately after the reading. The validity of measuring comprehension in this manner will be discussed later.

The test material for measuring ability in reading is composed of nine passages. See the following pages.¹ These passages were so selected that the increases in difficulty from one sample to the next represent fairly uniform steps.

Instructions for Administering the Tests. Explain to the pupils that they are to read silently as rapidly as they can and at the same

¹ These test blanks are printed on separate sheets and may be obtained in desired quantities from the author.

time to grasp as much as they can, and that they will be asked to write down, not necessarily in the same words, as much as they will remember of what they read.

They should also be told not to read anything over again, but to read on continuously as rapidly as is consistent with grasping what they read.

Use for a given grade the test blank that bears the same number as your grade. For example, use number 4 with the fourth grade, number 5 with the fifth grade, etc. On the next day repeat the test in the same manner, but use the blank of the next grade below yours, that is, in the fourth grade use number 3, in the fifth grade use number 4, etc. (For high school and college students, blanks number 8 and 9, or 7 and 9, may be used.)

The blanks for the test should be distributed to the pupils *with the backs of the blanks up*, so that no one will be able to read any of the material until all are ready. Then give the signal "turn" and "start." Allow them to read exactly thirty seconds. Then have the pupils make a mark with a pencil after the last word read to indicate how far they have read.

Then have them turn the blanks over immediately and write on the back all that they remember having read. Allow as much time as they need, but make sure that they do not copy from each other, or turn the blank over to see the text. Finally have them fill out the spaces at the bottom of the blank.

N.B. Make sure of allowing exactly 30 seconds for reading. See that they all start and stop at the same time.

It is recommended that the vocabulary test on page 37 be given in conjunction with the test for speed and comprehension. These three tests together will serve as a very adequate measure of a pupil's reading ability.

No. 1

Once there was a little girl who lived with her mother.

They were very poor.

Sometimes they had no supper.

Then they went to bed hungry.

One day the little girl went into the woods.

She wanted sticks for the fire.

She was so hungry and sad!

“Oh, I wish I had some sweet porridge!” she said.

“I wish I had a pot full for mother and me. We could eat it all up.”

Just then she saw an old woman with a little black pot.

She said, “Little girl, why are you so sad?”

“I am hungry,” said the little girl.

Name_____ Grade_____

School_____ City_____

Date_____

Reading Test, Series A
Prepared by D. Starob

No. 2

Betty lived in the South, long, long ago. She was only ten years old, but she liked to help her mother.

She had learned to do many things. She could knit and sew and spin; but best of all she liked to cook.

One day Betty was alone at home because her father and mother and brother had gone to town to see a wonderful sight.

The great George Washington was visiting the South. He was going from town to town, riding in a great white coach, trimmed with shining gold. It had leather curtains, and soft cushions. Four milk-white horses drew it along the road.

Four horsemen rode ahead of the coach to clear the way and four others rode behind it. They were all dressed in white and gold.

Name..... Grade.....

School..... City.....

Date.....

Reading Test, Series A
Prepared by D. Starch

No. 3

Little Abe hurried home as fast as his feet could carry him. Perhaps if he had worn stockings and shoes like yours, he could have run faster. But, instead, he wore deerskin leggings and clumsy moccasins of bearskin that his mother had made for him.

Such a funny little figure as he was, hurrying along across the rough fields! His suit was made of war homespun cloth. His cap was made of coonskin, and the tail of the coon hung behind him, like a furry tassel.

But if you could have looked into the honest, twinkling blue eyes of this little lad of long ago, you would have liked him at once.

In one hand little Abe held something very precious. It was only a book, but little Abe thought more of that book than he would have thought of gold or precious stones.

You cannot know just what that book meant to little Abe, unless you are very fond of reading. Think how it would be to see no books except two or three old ones that you had read over and over until you knew them by heart!

Name..... Grade.....

School..... City.....

Date.....

Reading Test, Series A
Prepared by D. Starob

No. 4

The red squirrel usually waked me in the dawn, running over the roof and up and down the sides of the house, as if sent out of the woods for this very purpose.

In the course of the winter I threw out half a bushel of ears of sweet corn onto the snow crust by my door, and was amused by watching the motions of the various animals which were baited by it. All day long the red squirrels came and went, and afforded me much entertainment by their maneuvers.

One would approach, at first, warily through the shrub oaks, running over the snow crust by fits and starts like a leaf blown by the wind. Now he would go a few paces this way, with wonderful speed, making haste with his "trotters" as if it were for a wager; and now as many paces that way, but never getting on more than half a rod at a time.

Then suddenly he would pause with a ludicrous expression and a somerset, as if all eyes in the universe were fixed on him. Then, before you could say Jack Robinson, he would be in the top of a young pitch pine, winding up his clock and talking to all the universe at the same time.

Name..... Grade.....
School..... City.....
Date.....

Reading Test, Series A
Prepared by D. Starch

No. 5

Once upon a time, there lived a very rich man, and a king besides, whose name was Midas; and he had a little daughter, whom nobody but myself ever heard of, and whose name I either never knew, or have entirely forgotten. So, because I love old names for little girls, I choose to call her Marygold.

This King Midas was fonder of gold than anything else in the world. He valued his royal crown chiefly because it was composed of that precious metal. If he loved anything better, or half so well, it was the one little maiden who played so merrily around her father's footstool. But the more Midas loved his daughter, the more did he desire and seek for wealth. He thought, foolish man! that the best thing he could possibly do for his dear child would be to give her the immensest pile of yellow, glistening coin, that had ever been heaped together since the world was made. Thus, he gave all his thoughts and all his time to this one purpose. If ever he happened to gaze for an instant at the gold-tinted clouds of sunset, he wished that they were real gold, and that they could be squeezed safely into his strong box. When little Marygold ran to meet him, with a bunch of buttercups and dandelions, he used to say, "Poh, poh, child! If these flowers were as golden as they look, they would be worth the plucking!"

And yet, in his earlier days, before he was so entirely possessed of this insane desire for riches, King Midas had shown a great taste for flowers.

Name..... Grade.....

School..... City.....

Date.....

Reading Test, Series A
Prepared by D. Starch

No. 6

In a secluded and mountainous part of Stiria there was in old time a valley of the most surprising and luxuriant fertility. It was surrounded on all sides by steep and rocky mountains, rising into peaks, which were always covered with snow, and from which a number of torrents descended in constant cataracts. One of these fell westward over the face of a crag so high that, when the sun had set to everything else, and all below was darkness, his beams still shone full upon this waterfall, so that it looked like a shower of gold. It was, therefore, called by the people of the neighborhood, the Golden River. It was strange that none of these streams fell into the valley itself. They all descended on the other side of the mountains, and wound away through broad plains and past populous cities. But the clouds were drawn so constantly to the snowy hills, and rested so softly in the circular hollow, that in time of drought and heat, when all the country round was burnt up, there was still rain in the little valley; and its crops were so heavy and its hay so high, and its apples so red, and its grapes so blue, and its wine so rich, and its honey so sweet, that it was a marvel to every one who beheld it, and was commonly called the Treasure Valley.

The whole of this little valley belonged to three brothers called Schwartz, Hans and Gluck. Schwartz and Hans, the two elder brothers, were very ugly men, with overhanging eyebrows and small dull eyes.

Name_____ Grade_____

School_____ City_____

Date_____

• Reading Test, Series A
Prepared by D. Starch

No. 7

Captain John Hull was the mint-master of Massachusetts, and coined all the money that was made there. This was a new line of business, for in the earlier days of the colony the current coinage consisted of gold and silver money of England, Portugal, and Spain. These coins being scarce, the people were often forced to barter their commodities instead of selling them.

For instance, if a man wanted to buy a coat, he perhaps exchanged a bearskin for it. If he wished for a barrel of molasses, he might purchase it with a pile of pine boards. Musket-bullets were used instead of farthings. The Indians had a sort of money called wampum, which was made of clam-shells, and this strange sort of specie was likewise taken in payment of debts by the English settlers. Bank-bills had never been heard of. There was not money enough of any kind, in many parts of the country, to pay the salaries of the ministers, so that they sometimes had to take quintals of fish, bushels of corn, or cords of wood instead of silver and gold.

As the people grew more numerous and their trade one with another increased, the want of current money was still more sensibly felt. To supply the demand the general court passed a law for establishing a coinage of shillings, sixpences, and threepences. Captain John Hull was appointed to manufacture this money, and was to have about one shilling out of every twenty to pay him for the trouble of making them.

Name_____ Grade_____

School_____ City_____

Date_____

No. 8

The years went on, and Ernest ceased to be a boy. He had grown to be a young man now. He attracted little notice from the other inhabitants of the valley; for they saw nothing remarkable in his way of life, save that, when the labor of the day was over he still loved to go apart and gaze and meditate upon the Great Stone Face. According to their idea of the matter, it was a folly, indeed, but pardonable, inasmuch as Ernest was industrious, kind, and neighborly, and neglected no duty for the sake of indulging this idle habit. They knew not that the Great Stone Face had become a teacher to him, and that the sentiment which was expressed in it would enlarge the young man's heart, and fill it with wider and deeper sympathies than other hearts. They knew not that thence would come a better wisdom than could be learned from books, and a better life than could be molded on the defaced example of other human lives. Neither did Ernest know that the thoughts and affections which came to him so naturally, in the fields and at the fireside, and wherever he communed with himself, were of a higher tone than those which all men shared with him.

By this time poor Mr. Gathergold was dead and buried; and the oddest part of the matter was, that his wealth, which was the body and spirit of his existence, had disappeared before his death, leaving nothing of him but a living skeleton, covered over with a wrinkled, yellow skin. Since the melting away of his gold, it had been very generally conceded that there was no such striking resemblance, after all, betwixt the ignoble features of the ruined merchant and that majestic face upon the mountainside.

Name _____ Grade _____

School _____ City _____

Date _____

No. 9

To an American visiting Europe, the long voyage he has to make is an excellent preparative. The temporary absence of worldly scenes and employments produces a state of mind peculiarly fitted to receive new and vivid impressions. The vast space of waters that separates the hemispheres is like a blank page in existence. There is no gradual transition, by which, as in Europe, the features and population of one country blend almost imperceptibly with those of another. From the moment you lose sight of the land you have left, all is vacancy until you step on the opposite shore, and are launched at once into the bustle and novelties of another world.

In traveling by land there is a continuity of scene and a connected succession of persons and incidents, that carry on the story of life, and lessen the effect of absence and separation. We drag, it is true, "a lengthening chain," at each remove of our pilgrimage; but the chain is unbroken: we can trace it back link by link; and we feel that the last still grapples us to home. But a wide sea voyage severs us at once. It makes us conscious of being cast loose from the secure anchorage of settled life, and sent adrift upon a doubtful world. It interposes a gulf, not merely imaginary, but real, between us and our homes — a gulf subject to tempest, and fear, and uncertainty, rendering distance palpable, and return precarious.

Such, at least, was the case with myself. As I saw the last blue line of my native land fade away like a cloud in the horizon, it seemed as if I had closed one volume of the world and its concerns, and had time for meditation, before I opened another.

Name..... Grade.....

School..... City.....

Date.....

Instructions for Scoring the Tests. The speed of reading is determined by ascertaining the number of words read per second. This can be done very rapidly by having a blank on which is indicated the number of each word. By this blank the total number of words read can be determined instantaneously. Dividing by thirty will give the speed of reading per second. The average number of words read per second for the two passages is taken as the score for speed.

Comprehension is determined by counting the number of words written which correctly reproduce the thought. The written account is carefully read, and all words which either reproduce the ideas of the test passage or repeat ideas previously recorded are crossed out. The remaining words are counted and used as the index of comprehension. The average of the two tests is taken as the final score. On an average about 7 per cent of the words written need to be discarded. In many papers nothing needs to be discarded. Various objections may be urged against this method of scoring, but these are believed not to be serious. They will be considered later.

A sample test follows to illustrate the method of scoring. It is the record of an eighth-grade girl with test No. 8. This pupil had read 142 words, or 3.7 words per second. She wrote 77 words, five of which were discarded. These are inclosed in parenthesis in the following :

The years went on and Ernest grew to be a man. He was not so very well known in the valley as he was quite (with, know, habits, besides, always) at night when his work was done, he went aside and watched the great stone face. As he was industrious and kind and only indulged in this idle amusement the neighbors thought it all right. They did not know that the great Stone Face became a teacher to him.

A considerable amount of time in scoring comprehension may be saved in cases where only the average for a class is desired by simply counting the number of words written by each pupil without discarding anything, by obtaining next the average of these scores, and by reducing then this average by 7%. This plan will give just as reliable an average as the longer method of scoring. When, however, the score for individual pupils is desired, the longer method must be followed.

Standards of Attainment in Reading. In every branch of instruction in the public schools we need a definite standard of attain-

ment to be reached at the end of each grade. If we had such standards and if we had adequate means of precisely measuring ability, it would be possible for a qualified person to go into a schoolroom and measure the attainment in any or all subjects and determine on the basis of these measurements whether the pupils are up to the standard, whether they are deficient, how much, and in what specific respects.

The following are standard scores of attainment for the ends of the respective years, based on over 6000 pupils in 27 schools. These scores are represented in the graphs in Fig. 8. The tests have been made, however, with approximately 75,000 pupils.

Grades	1	2	3	4	5	6	7	8
Speed of reading (words per second)	1.5	1.8	2.1	2.4	2.8	3.2	3.6	4.0
Comprehension (words written) . .	15	20	24	28	33	38	45	50

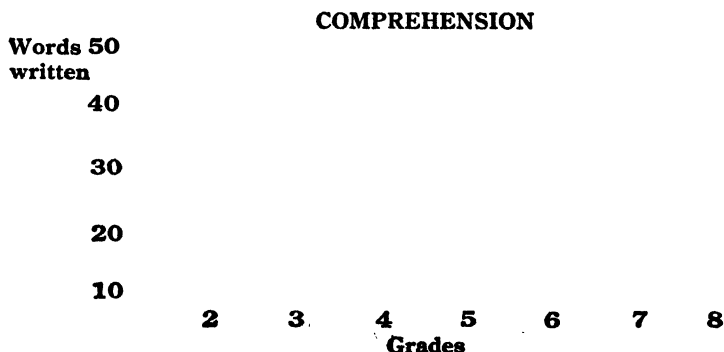
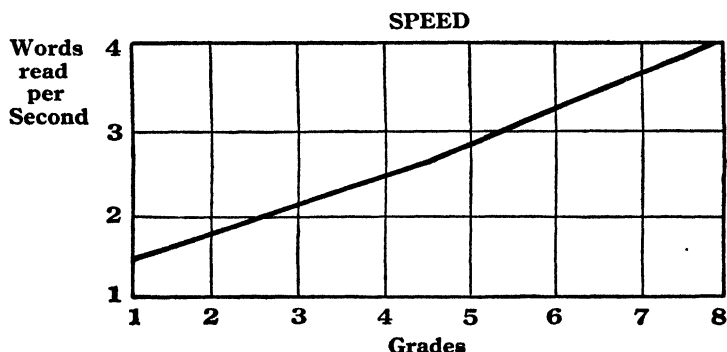


FIG. 8. — Standard curves for reading.

In many instances it is desirable to express a pupil's reading ability by one score which shall combine both speed and comprehension. For example, one pupil has a score of 3.0 words per second for speed and 25 for comprehension. Another pupil has a score of 3.0 for speed and 44 for comprehension. It is desirable to express each pupil's ability by a single figure which may be compared directly with a single figure of any other pupil.

If we may assume, as we shall do here, that a growth in speed from the first grade to the eighth is equal to the parallel growth in comprehension from the first to the eighth, then the growth in speed of 2.5, from 1.5 in the first grade to 4.0 in the eighth, is equal

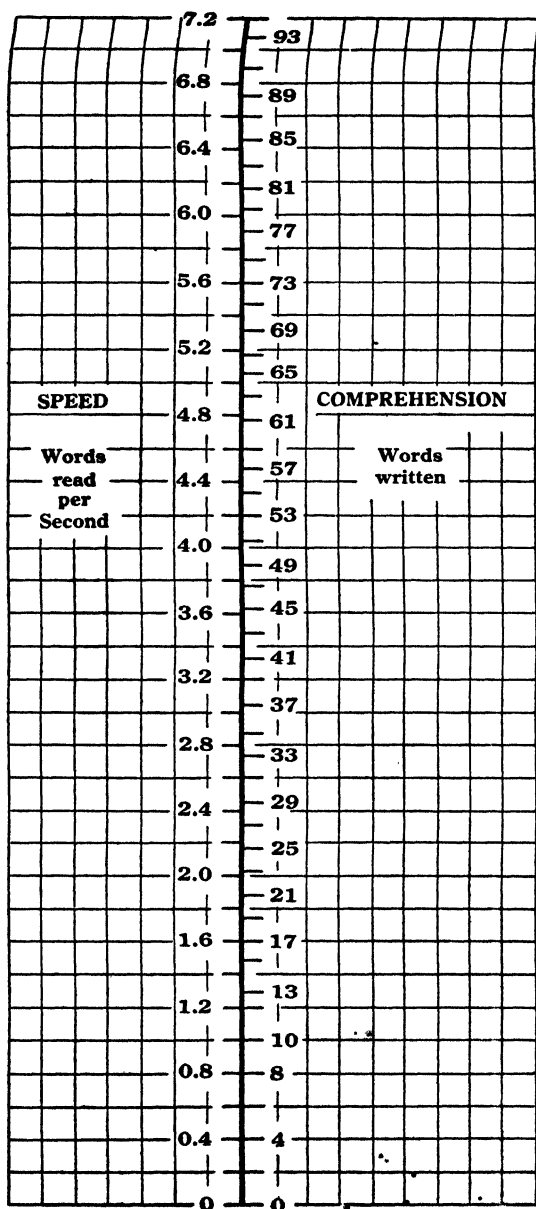


FIG. 9. — Scale for equating speed and comprehension of reading.

to a growth in comprehension of 35, from 15 in the first grade to 50 in the eighth grade. Hence a growth of .1 of a word in speed is equal to a growth of 1.4 words in comprehension. On this basis we may equate the score for speed and comprehension simply and quickly according to the principle of a slide rule as represented in Fig. 9. The scale for speed is given on the left side and the corresponding units of the scale for comprehension on the right side. The single score combining speed and comprehension for a given pupil can be read off instantaneously and may be expressed in terms either of speed or of comprehension. For example, the first pupil mentioned in the preceding paragraph, with a score of 3.0 for speed and 25 for comprehension, would have a single score of 2.6 in terms of speed or 31 in terms of comprehension. This is done by finding 3.0 on the scale for speed and 25 on the scale for comprehension. The

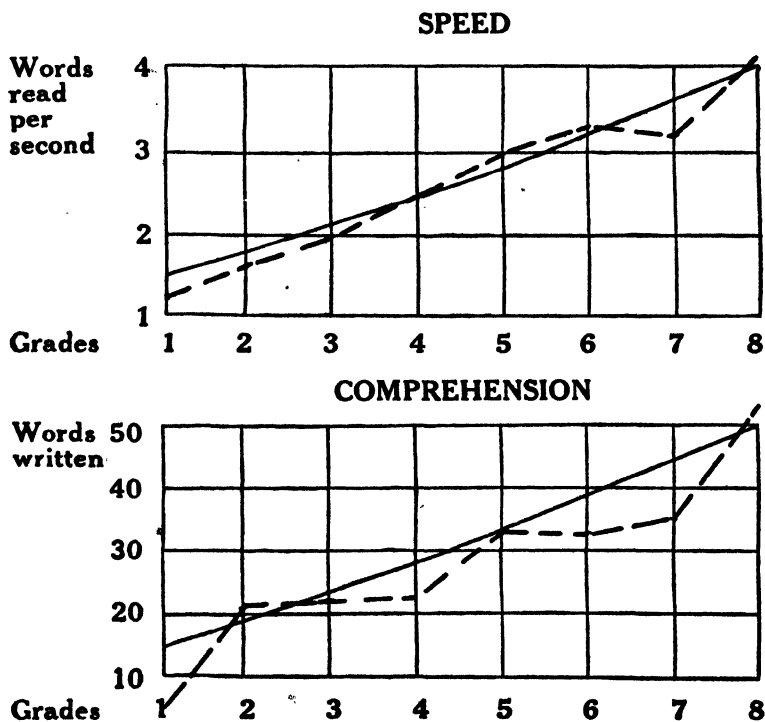


FIG. 10. — Graphs for reading showing the comparison of a large school with the standard curves. The continuous lines are the standard curves, and the broken lines represent the school.

equivalent value for 25 in terms of speed is 2.2, the number opposite 25 on the speed scale. The average of 3.0 and 2.2 is 2.6. Or, if it is desirable to express this single score in terms of comprehension, then the score is 31, which is the value opposite 2.6. The single score of the second pupil with a score of 3.0 in speed and 44 in comprehension would be 3.3 in terms of speed, or 42 in terms of comprehension. In order to have uniformity it will be desirable to express this single score in terms of speed rather than in terms of comprehension. The second pupil would be better than the first by .7; that is, he would be as much better than the first as a difference in speed of reading .7 of a word more per second would indicate, comprehension being the same in both.

By means of the standard curves it is possible to compare accurately the actual attainment in reading of an individual pupil, of an

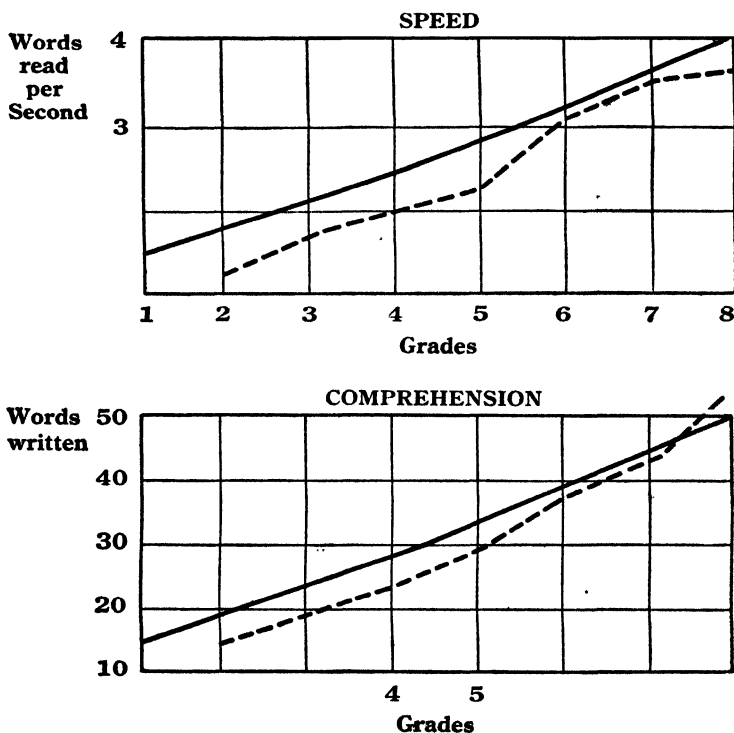


FIG. 11. — Graphs for reading showing the comparison of a small school with the standard curves. The continuous lines are the standard curves, and the broken lines represent the school. Most of the grades are nearly an entire grade behind their respective standards.

entire grade, of an entire school or of a whole school system. Figure 10 shows the comparison with the standards of an elementary school of 401 pupils in a city of 40,000 population. Figure 11 gives the results of a test in a small city of about 2000 population. There is considerable deficiency in nearly all grades in the latter city, which is probably due to the large foreign element. This is indicated by the fact that some of the pupils wrote their tests in a foreign language.

Critical Points concerning the Reliability of the Tests. First, the time limit. Does reading for thirty seconds adequately test a person's reading capacity? The time limit of thirty seconds was chosen, first, because the necessary material for this interval could all be printed on a sheet of paper about the size of an ordinary page in a reader, and, second, because a longer interval of time would increase very materially the labor of scoring the results. But irrespective of length of text or labor of scoring, the chief point is the reliability of the tests.

In order to determine whether thirty seconds is an adequate length of time, a test was made on a group of persons with two longer passages, one requiring approximately two and one half minutes to read and the other approximately five minutes. Speed and comprehension were determined in the same manner as in the regular tests.

These results showed that a person's performance in one passage is practically the same as in any other and that the interval of thirty seconds is sufficiently long to give a very adequate test of a person's reading capacity both in regard to speed and comprehension.

A second critical point is the increasing difficulty of the test passages. These nine selections were chosen after some experimentation so that the successive passage would increase in difficulty by approximately uniform steps. Perfect uniformity in the steps is not absolutely necessary, since the growth in reading capacity from grade to grade can be measured by the method described; namely, of testing each grade with its own sample and also with the sample of the grade just below it, and if desired, also with the sample of the grade just above it.

Objection to some of the passages might be taken on the ground that they are more or less familiar fables or pieces of literature. But a comparison of the results with the different passages gave no indi-

cation that selection No. 5 about King Midas was read more rapidly or retained more fully than its position demanded. There is every indication on the basis of the tests made thus far that the familiarity gained in the ordinary reading in school with any passage will not appreciably affect the tests unless the reading has been done very recently, say, within a month preceding the test. This point can always be checked up by the fact that the tests on the same pupils are made with two different passages.

A third point which must be considered is the written reproduction of the thought as an index of comprehension. Some pupils may be able to express themselves more readily in writing and others more readily in speaking. Ideally, the comprehension should perhaps be tested by having each pupil state orally in his own words what he had read and by having a stenographic report of his statements. This method would entail much difficulty and require an enormous amount of time, as each child would have to be tested individually with the aid of a stenographer, and in the end it would probably be no better as an index of comprehension. The method of determining comprehension employed in our measurements of reading has been tested in various ways and found to be accurate as well as convenient.

In order to determine the validity of these reading tests from a different angle, a comparison was made between the efficiency in reading as shown by the tests and the efficiency as indicated by the marks in reading assigned by the teachers. This comparison, made in a school of 256 pupils, showed a close agreement between the tests and the reading as estimated by the teachers. There is every reason for believing that the real reading capacity of a child is measured accurately by means of these tests, and far more accurately than by the most conscientious marking.

A fourth point regarding the validity of the tests relates to the method of scoring comprehension; namely, of counting the number of written words which correctly express the thought of the test passage. This method was adopted because it is simple, rapid and objective. Several other methods of scoring were tried out, but it was found that the method here used is accurate and reliable. In fact, it is fully as accurate as the combined judgment of ten competent teachers.

English Vocabulary Test.¹ A useful and important supplementary measurement of reading ability is a test for determining the comprehension of individual words and the range of a person's reading vocabulary. For this purpose the following test has been designed. It measures the percentage of words of the entire English vocabulary as well as the absolute number of words that a person understands. The test consists of several sets of 100 words each which were selected at uniform intervals from the entire English vocabulary. Each list of 100 was selected by taking the first word on every 23d page of Webster's New International Dictionary (1910). List I contains the words from pages 23, 46, 69, etc., and list II from pages 24, 47, 70, etc. This method of selection yields a fair and representative sampling of the entire English vocabulary.

ENGLISH VOCABULARY TEST

Name	Grade	School	Date
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Make a check mark (✓) after each word whose meaning you are sure of and which you could certainly use correctly.

Write the meaning after such other words as you are familiar with but of whose meaning you are not sure.

Then you will be asked by the examiner to write the meaning after any of the difficult words that you may have checked, so as to make sure that you did not check any that you did not know. If you cannot give a meaning, cross the word off. Words which are similar to common words but which have entirely different meanings, will especially be called for, such as belleric, canon, to cree, Mut, peavey, etc.

LIST I

- | | | |
|------------------|----------------------|--------------------|
| 1. acta | 16. chancroid | 31. eloquence |
| 2. agriculturist | 17. to chop | 32. epicene |
| 3. ambulacrum | 18. clearness | 33. evaporative |
| 4. abnormal | 19. collar | 34. faction |
| 5. Araneida | 20. to comprobate | 35. to flat |
| 6. assagai | 21. constructiveness | 36. forest |
| 7. awaft | 22. to cree | 37. fubby |
| 8. barker | 23. correal | 38. to gazette |
| 9. belleric | 24. currency | 39. glonoin |
| 10. bizarre | 25. death | 40. gyral |
| 11. bonmot | 26. departmental | 41. hautboy |
| 12. bridle | 27. difference | 42. heterogony |
| 13. butter-cup | 28. displayed | 43. hordeaceous |
| 14. canon | 29. to dow | 44. hyperkeratosis |
| 15. Catananche | 30. dysodile | 45. to implore |

¹ Copies of this test sheet may be obtained in desired quantities from the author.

- | | | |
|-------------------|------------------|-----------------|
| 46. to infatuate | 65. owlet | 84. to sluice |
| 47. to interlay | 66. parallel | 85. spadroon |
| 48. Italianate | 67. to peal | 86. spur |
| 49. Jupiter | 68. personab | 87. stipulator |
| 50. knowledgeable | 69. to piece | 88. subregion |
| 51. Latin | 70. Pleurotoma | 89. sweet |
| 52. lewis | 71. portrait | 90. tarsus |
| 53. loam | 72. prevailing | 91. Theatin |
| 54. Lycoperdon | 73. proveditor | 92. tipburn |
| 55. mange | 74. quadruple | 93. to transfer |
| 56. mayonnaise | 75. rapt | 94. to trump |
| 57. mesotasis | 76. reformer | 95. unbeseem |
| 58. miscue | 77. respectful | 96. upholsterer |
| 59. moon | 78. river | 97. vernier |
| 60. musk | 79. rutter | 98. waldgrave |
| 61. neovolcanic | 80. sawmill | 99. wharf |
| 62. to notate | 81. secessionist | 100. zelotypia |
| 63. off-shore | 82. sex | |
| 64. organdie | 83. sigmoid | |

LIST II

- | | | |
|-------------------|----------------------|-------------------|
| 1. action | 28. downright | 55. manifest |
| 2. aigrett | 29. eaglet | 56. meadow-sweet |
| 3. amentia | 30. emancipationist | 57. metabasis |
| 4. antagonism | 31. epigastrium | 58. misgive |
| 5. arbustive | 32. evergreen | 59. moorland |
| 6. assent | 33. faddy | 60. Mut |
| 7. awry | 34. ferret | 61. Neptune |
| 8. barometer | 35. flaw | 62. noticeable |
| 9. belonging | 36. to for-gather | 63. oil |
| 10. black | 37. fulgurous | 64. orgy |
| 11. book | 38. Gelasimus | 65. oxidizable |
| 12. brighten | 39. glossopharyngeal | 66. paranephritis |
| 13. buttress | 40. grass | 67. peavey |
| 14. cantharsis | 41. Habenaria | 68. perspicuous |
| 15. to catch | 42. hawk | 69. piety |
| 16. change | 43. heterotopism | 70. Plotinism |
| 17. Choripetalæ | 44. horner | 71. positive |
| 18. collectivity | 45. hypnotherapy | 72. to prick |
| 19. conational | 46. imposture | 73. to provoke |
| 20. consumptive | 47. infidelity | 74. qualifier |
| 21. corresponding | 48. intermissive | 75. rasorial |
| 22. crenate | 49. iva | 76. to refuse |
| 23. curtain | 50. jusi | 77. rest |
| 24. debentured | 51. laudanine | 78. to roast |
| 25. to deplore | 52. libellary | 79. sabbatism |
| 26. diffluence | 53. local | 80. scabbed |
| 27. disputable | 54. lymphoma | 81. secretarial |

82. to shackle	89. to swerve	96. upthrow
83. to signify	90. to taste	97. vertebra
84. small	91. then	98. wheat
85. Spanish	92. tissue	99. walled
86. square	93. transpire	100. Zibet
87. to stock	94. trunnion	
88. subspecific	95. uncharged	

The test is given according to the specifications at the head of the sheet. A pupil's score is the average number of words designated correctly in the two lists. This score will be the percentage of words that he understands in the two lists as well as the percentage of words of the entire English vocabulary that he understands. An average of two lists will give an accurate measure of the size of a person's reading vocabulary. The mean variation of the scores obtained from the two lists is approximately 2.5, indicating a rather high degree of accuracy. Greater accuracy can be obtained by testing with more than two sets, but that will rarely be needed. Additional test lists can be prepared by following the principle of selection employed in lists I and II.

The following are tentative standard scores for the various years as determined from tests made in four schools:

ELEMENTARY					HIGH SCHOOL				UNIVERSITY				
Grades . . .	4	5	6	7	8	1	2	3	4	1	2	3	4
Scores . . .	30	33	36	39	42	45	47.5	50	53	56	58.5	61	63

Individual Differences and the Overlapping of Grades. One of the most important, if not the most important, discovery of the recent measurements of efficiency in school studies, is the enormous range of differences in capacity shown by the pupils in the same class or grade. There is a tacit feeling that when a pupil is promoted to the next higher grade his capacity is distinctly superior to the average ability of the pupils left behind, and that the pupils of any given grade, while not alike, are individually and collectively superior to the average or even to the better ones of the next lower grade.

It is, therefore, most surprising to find that the abilities shown by the pupils of any grade, with the possible exception of the first and second, are distributed over the entire scale. For example, there are pupils in the fourth grade whose attainment in reading is higher than that of the average eighth-grade pupil. Likewise,

there are pupils in the fourth grade whose attainment in reading is inferior to that of the average first-grade pupil.

To show these facts concretely, the distributions of the reading abilities of the pupils in each grade in a certain school are shown in the graphs of Fig. 12. These distribution curves are based on single scores in which speed and comprehension are combined according-

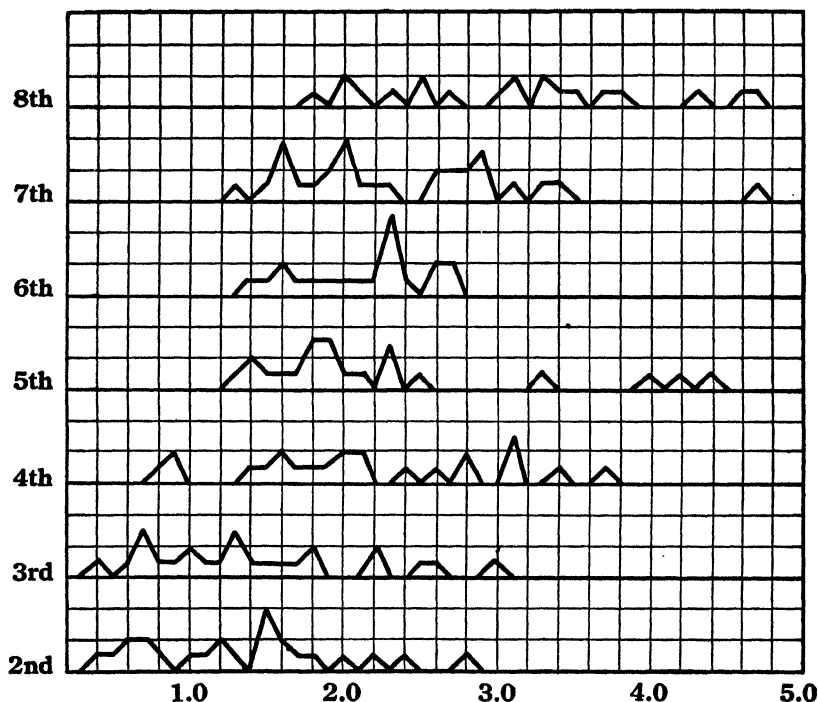


FIG. 12. — The numbers along the base line represent scores for speed and comprehension combined as expressed in terms of speed. The lowest curve represents the distribution of the pupils in the second grade, the next one for the third grade, etc.

ing to the slide rule scale. It will be seen at a glance that the ranges of difference are astoundingly wide. The five best pupils in the second grade read as well as the seven poorest in the eighth grade.

A study similar to that shown in Fig. 12 was made of all the grades in three schools, each in a different city. The results were identical in every respect with those shown in Fig. 12. The range of differences and the overlapping were just as large. Furthermore,

it was found that, in speed and comprehension combined, 31.8 per cent of the pupils of any grade reached or exceeded the median of the next grade above, 20.1 per cent reached or exceeded the median of the second grade above, 13.2 per cent reached or exceeded the median of the third grade above, and 3.3 per cent reached or exceeded the median of the fourth grade above. In other words, one third of the pupils of any given grade could do the reading work of the next grade above as well as the average of that grade, one fifth could do the work of the second above it as well as the average of that grade, and one eighth could do the work of the third grade above it as well as the average of that grade. Likewise, corresponding percentages of pupils in any given grade are no more efficient in reading than the pupils one, two, or three grades below it.

Should these differences be taken into account in our schools? Should the pupils be reclassified into higher or lower classes according to their capacities? The facts presented here reveal the situation as it actually exists at the present time.

Thorndike's Reading Tests. Thorndike has prepared two reading tests, one for measuring ability in reading words and the other for reading sentences. The vocabulary test consists of a series of steps graded in uniformly increasing amounts of difficulty. Each step has five words of equal difficulty. These words were selected from a much larger list whose difficulty was determined experimentally by tests on a large number of children. A pupil's score in the test is the number of the highest step passed, and a step is passed if not more than one of the five words is missed.

The test is convenient, definite and easily scored. Its chief limitations are that it has a predominance of names of flowers and animals, which would give undue advantage to some pupils; and that it has only five words in each step, which would be an advantage to some pupils and a disadvantage to others. Both of these defects may be remedied by modifications and additions of words. Scale A and scale Alpha measure comprehension primarily. They do not measure the other important element of reading, namely speed.

The test for measuring the understanding of sentences is scored by determining how the questions are answered. A detailed system of scoring is outlined in the original monograph.

THORNDIKE READING SCALE A
VISUAL VOCABULARY

Write your name here.....

Write your age here.....years.....months

Look at each word and write the letter F under every word that means a *flower*.

Then look at each word again and write the letter A under every word that means an *animal*.

Then look at each word again and write the letter N under every word that means a *boy's name*.

Then look at each word again and write the letter G under every word that means a *game*.

Then look at each word again and write the letter B under every word that means a *book*.

Then look at each word again and write the letter T under every word like *now* or *then* that means something to do with *time*.

Then look at each word again and write the word GOOD under every word that means something *good to be* or *do*.

Then look at each word again and write the word BAD under every word that means something *bad to be* or *do*.

4. camel, samuel, kind, lily, cruel
5. cowardly, dominoes, kangaroo, pansy, tennis
6. during, generous, later, modest, rhinoceros
7. claudé, courteous, isaiah, merciful, reasonable
8. chrysanthemum, considerate, lynx, prævaricate, reuben

9. ezra, ichabod, ledger, parchesi, preceding
10. crocus, dahlia, jonquil, opossum, poltroon
- 10.5 begonia, equitable, pretentious, renegade,
reprobate
11. armadillo, iguana, philanthropic

THE THORNDIKE SCALES
PUBLISHED BY TEACHERS COLLEGE
NEW YORK CITY

SCALE ALPHA

FOR MEASURING THE UNDERSTANDING OF SENTENCES

Write your name here.....

Write your age.....years.....months.

SET *a*

Read this and then write the answers. Read it again as often as you need to.

John had two brothers who were both tall. Their names were Will and Fred. John's sister, who was short, was named Mary. John liked Fred better than either of the others. All of these children except Will had red hair. He had brown hair.

1. Was John's sister tall or short?.....
2. How many brothers had John?.....
3. What was his sister's name?.....

SET *b*

Read this and then write the answers. Read it again as often as you need to.

Long after the sun had set, Tom was still waiting for Jim and Dick to come. "If they do not come before nine o'clock," he said to himself, "I will go on to Boston alone." At half past eight they came bringing two other boys with them. Tom was very glad to see them and gave each of them one of the apples he had kept. They ate these and he ate one too. Then all went on down the road.

1. When did Jim and Dick come?.....
2. What did they do after eating the apples?.....
3. Who else came besides Jim and Dick?.
4. How long did Tom say he would wait for them?
5. What happened after the boys ate the apples?

SET *c*

Read this and then write the answers. Read it again as often as you need to.

It may seem at first thought that every boy and girl who goes to school ought to do all the work that the teacher wishes done. But sometimes other duties prevent even the best boy or girl from doing so. If a boy's or girl's father died and he had to work afternoons and evenings to earn money to help his mother, such might be the case. A good girl might let her lessons go undone in order to help her mother by taking care of the baby.

1. What are some conditions that might make even the best boy leave school work unfinished?
2. What might a boy do in the evenings to help his family?
3. How could a girl be of use to her mother?
4. Look at these words: *idle, tribe, inch, it, ice, ivy, tide, true, tip, top, tit, tat, toe.*

Cross out every one of them that has an *i* and has not any *t* (T) in it.

SET *d*

Read this and then write the answers. Read it again as often as you need to.

It may seem at first thought that every boy and girl who goes to school ought to do all the work that the teacher wishes done. But sometimes other duties prevent even the best boy or girl from doing so. If a boy's or girl's father died and he had to work afternoons and evenings to earn money to help his mother, such might be the case. A good girl might let her lessons go undone in order to help her mother by taking care of the baby.

1. What is it that might seem at first thought to be true, but really is false?
2. What might be the effect of his father's death upon the way a boy spent his time?
.....
3. Who is mentioned in the paragraph as the person who desires to have all lessons completely done?
.....
4. In these two lines draw a line under every 5 that comes just after a 2, unless the 2 comes just after a 9. If that is the case, draw a line under the next figure after the 5:

5 3 6 2 5 4 1 7 4 2 5 7 6 5 4 9 2 5 3 8 6 1 2 5
4 7 3 5 2 3 9 2 5 8 4 7 9 2 5 6 1 2 5 7 4 8 5 6

Standard Scores. No standard scores have been determined thus far. Childs¹ found the following June scores for 754 pupils in Bloomington, Indiana.

Grade (A and B) . .	4	5	6	7	8
Score (Scale A) . .	8.06	9.07	10.28	10.80	10 $\frac{1}{2}$.23

Kansas Silent Reading Test.² This test was devised by Professor F. J. Kelly for the purpose of measuring primarily comprehension of reading on the principle of simple responses to short paragraphs to indicate the correct or incorrect understanding of the passage. The chief advantage of the test is the simplicity of scoring the results. The chief disadvantages are that the test does not measure directly the speed of reading and that many of the passages tend to be chiefly exercises in reasoning or in solving puzzles. Nevertheless they will furnish undoubtedly important indices of ability in reading.

Directions for Giving the Tests

After telling the children not to open the papers, ask the children on the front seats to distribute the papers, placing one upon the desk of each pupil in the class. Have each child fill in the blank space at the top of this page. Then make clear the following: .

Instructions to be Read by Teacher and Pupils Together

This little five-minute game is given to see how quickly and accurately pupils can read silently. To show what sort of game it is, let us read this:

Below are given the names of four animals. Draw a line around the name of each animal that is useful on the farm:

cow tiger rat wolf

¹ Childs, H. G. Fifteenth Yearbook of the National Society for the Study of Education, 1916, p. 81.

² Copies of these tests may be obtained in desired quantities from the State Normal School, Emporia, Kansas.

THE MEASUREMENT OF ABILITY IN READING

This exercise tells us to draw a line around the word cow. No other answer is right. Even if a line is drawn under the word cow, the exercise is wrong, and counts nothing. The game consists of a lot of just such exercises, so it is wise to study each exercise carefully enough to be sure that you know exactly what you are asked to do. The number of exercises which you can finish thus in five minutes will make your score, so do them as fast as you can, being sure to do them right. Stop at once when time is called. Do not open the papers until told, so that all may begin at the same time.

The teacher should then be sure that each pupil has a good pencil or pen. Note the minute and second by the watch, and say, BEGIN.

ALLOW EXACTLY FIVE MINUTES.

Answer no questions of the pupils which arise from not understanding what to do with any given exercise.

When time is up say STOP and then collect the papers at once.

Test for Grades 3, 4, and 5

No. 1

I have red, green, and yellow papers in my hand. If I place the red and green papers on the chair, which color do I still have in my hand?

Value
1.2

No. 2

Think of the thickness of the peelings of apples and oranges. Put a line around the name of the fruit having the thinner peeling.

Value
1.2

apples oranges

No. 3

Three words are given below. One of them has been left out of this sentence: I cannot — the girl who has the flag. Draw a line around the word which is needed in the above sentence.

Value
1.4

red see come

No. 4

There are seven boys and twelve girls in a room. If there are more boys than girls, write boys on the line below. If more girls than boys, write girls on the line below.

Value
1.4

No. 5

Value 1.6 If you would rather have a dollar than a little stone, do not put a line under dollar, but if you would rather have five dollars than a pencil, put a line under stone.

dollar stone

No. 6

Value 1.7 The first letter in the alphabet is "a." Below are some words containing the letter "a." Draw a line under the one in which the first letter of the alphabet is found the greatest number of times.

hat easy baby age alas manfully

No. 7

Value 1.8 A child wrote these letters on the blackboard, b y a k. He then rubbed out one letter and put c in its place. He then had b y c k on the blackboard. What was the letter which he erased?

No. 8

Value 1.9 Count the letters in each of the words written below. You will find that pumpkin has seven letters, and thanks has six letters. One of the words has five letters in it. If you can find the one having five letters, draw a line around it.

breeze thanks yours pumpkin duck

No. 9

Value 2.0 Here are some names of things. Put a line around the name of the one which is most nearly round in every way like a ball.

saucer teacup orange pear arm

No. 10

Value 2.1 A recipe calls for milk, sugar, cornstarch and eggs. I have milk, sugar and eggs. What must I get before I can use the recipe?

No. 11

We planted three trees in a row. The first one was nine feet tall and the last one was three feet shorter than the first one. The middle one was two feet taller than the last one. How tall was the middle one?

Value
2.2

No. 12

Below are three lines. If the middle line is the longest, put a cross after the last line. If the last line is the longest, put a cross after the first line. If the first line is the longest, put a circle in front of the middle line.

Value
2.2

No. 13

Three men have to walk to a town ten miles away. Each man carries a load. The first carries 25 pounds, the second 30 pounds and the third 40 pounds. The heavier the load, the slower the man travels. In order that they may arrive in town at the same time, which man must start first?

Value
3.1

No. 14

My house faces the street. If a boy passes my house going to school in the morning, walking toward the rising sun, with my house on his right hand, which direction does my house face?

Value
3.5

No. 15

Fred has eight marbles. Mary said to him: "If you will give me four of your marbles, I will have three times as many as you will then have." How many marbles do they both have together?

Value
4.8

No. 16

If in the following words e comes right after a more times than e comes just after i, then put a line under each word containing an e and an i, but if e comes just before a more often than right after i, then put a line under each word containing an a and an e.

Value
8.9

receive feather teacher believe

Test for Grades 6, 7 and 8

No. 1

Value 1.0 The air near the ceiling of a room is warm, while that on the floor is cold. Two boys are in the room, James on the floor and Harry on a box eight feet high. Which boy has the warmer place?

No. 2

Value 1.3 If gray is darker than white and black is darker than gray, what color of those named in this sentence is lighter than gray?

No. 3

Value 1.6 We can see through glass, so we call it transparent. We cannot see through iron, so we call it opaque. Is black ink opaque, or is it transparent?

No. 4

Value 2.0 My shepherd dog can run faster than any of my father's large herd of cattle, but he will not chase a rabbit because he learned long ago that a rabbit could easily outrun him. If my dog is no slower than other shepherd dogs, draw a line under the fastest runner of the three animals named below.

rabbit shepherd dog cow

No. 5

Value 2.2 If you find a word in this sentence which may be used to denote color, draw a line under it; but if you do not find such a word, draw a line under the first word of the sentence.

No. 6

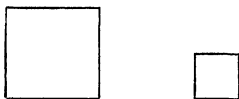
Value 2.3 In going to school, James has to pass John's house, but does not pass Frank's. If Harry goes to school with James, whose house will Harry pass, John's or Frank's?

No. 7

Value 2.4 A boy goes to school in the morning, goes home at noon for lunch, returns to school at 1 o'clock and returns home at 4 o'clock. How many times does he travel between home and school that day?

No. 8

Here are two squares. Draw a line from the upper left-hand corner of the small square to the lower right-hand corner of the large square.

Value
2.6

No. 9

A farmer puts one half the hay from his field into the first stack, then two thirds of what is left into a second stack and the remainder in a third stack. Which stack is the largest?

Value
3.0

No. 10

Below are two squares and a circle. If the circle is the largest of the three, put a cross in it. If one square is smaller than the circle, put a cross in the large square. If both squares are smaller than the circle, put a cross in the small square.

Value
3.9

No. 11

"The curfew tolls the knell of parting day,
The lowing herds wind slowly o'er the lea,
The ploughman homeward plods his weary way,
And leaves the world to darkness and to me."
(Gray)

Value
4.0

Study the above quotation carefully. The author lets us know his feeling about the coming of night. If you think his feeling is one of fear and dread, underscore curfew. If his feeling is one of peace and gladness, underscore ploughman.

No. 12

Read these carefully :

Value
4.0 Bears are larger than bugs.
 Houses are larger than bears.
 Mountains are larger than houses.
 Then bugs are not as large as mountains.

I have tried to make no false statement among these four. If I have succeeded, underline the word success. If I have failed, underline the word failure.

success failure

No. 13

Value
4.3 If a man takes an hour to walk around a square each side of which is a mile in length, how long will it take him to walk eight miles?

No. 14

A list of words is given below. One of them is needed to complete the thought in the following sentence: The roads became muddy when the snow —

Value
4.9 Do not put the missing word in the blank space left in the sentence, but put a cross below the word in the list which is next above the word needed in the sentence.

water
is
melted
snow

No. 15

Value
5.8 I am writing this paragraph to test your ability to read what I compose. Underscore any word in the paragraph which has the same number of letters as the third word from the beginning of the paragraph but which has none of the same letters.

No. 16

Value
10.2 My mother's birthday and mine are on the same day. We always have a round birthday cake together. We put as many candles in a row around the cake as my mother is years old, but not all the candles are white ones. We use as many red ones as I am years old. This year we used ten red ones. We found that between each two red ones we had to place two white ones. How old is mother?

Test for Grades 8, 9, 10, 11 and 12

No. 1

Mary is older than Nellie, and Nellie is older than Kate. Which girl is older, Mary or Kate? Value
2.1

No. 2

My fingers were numb with cold from carrying my skates. My breath looked like steam before my face and froze into a thick frost on my muffler. My mother saw me coming and called, "Clean off your shoes and then come in and get warm." Which do you think I had on my shoes, mud or snow? Value
3.3

No. 3

I have five plums and Mary has four plums. Jane comes along and we see that she hasn't any. We want to divide with Jane in such a way that we shall all three have the same number. I give Jane two plums. How many must Mary give her? Value
3.5

No. 4

In the following words, find one letter which is contained in only three of them and then cross out the word which does not contain that letter. Value
3.7

ail thief live anvil

No. 5

A, B, C and D on the line below represent four places lying in a straight line. From A to B is 4 miles, from C to D is 7 miles, from A to D is 14 miles. How far is it from B to C? Value
3.8

A ————— B ————— C ————— D

No. 6

Bone is composed of animal matter and mineral matter. The former gives it toughness and the latter rigidity. Yesterday I placed a bone from a chicken's leg in a bottle of acid, and found this morning that I could wrap the bone around my finger like gristle. Which kind of matter was removed from the bone? Value
4.3

No. 7

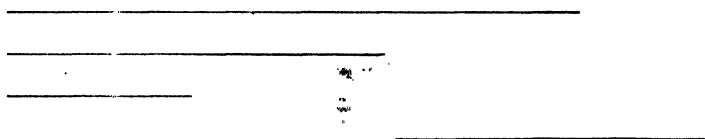
Value
4.4

The pitch of a tone depends on the number of vibrations made by the vibrating body in a second of time. The greater the number of vibrations per second, the higher the tone. Two bodies are made to vibrate, the former 256 times a second, and the latter 384 times a second. Which produces the lower tone, the former or the latter?

No. 8

Value
4.8

There are three horizontal lines ; the first is three inches in length, the second two inches, the third one inch. We know that if the second and third lines are joined end to end the resulting line will be as long as the first line. Suppose that the first and second lines are joined end to end. How many times as long as the third line will the resulting line be?



No. 9

Value
4.9

It was a quiet, snowy day. The train was late. The ladies' waiting room was dark, smoky and close, and the dozen women, old and young, who sat waiting impatiently, all looked cross, low spirited or stupid.

In this scene the women probably kept their wraps on, because they wished to be ready to take the train. Pretty soon the station agent came and put more coal in the stove, which was already redhot in spots. Do you think this made the women happier?

No. 10

Value
5.6

Below are three lines. If the first line is the shortest, place a dot above it. If the last line is shorter than the first but longer than the middle line, put a cross above the longest. If each of the other lines is longer than the last line, put a cross above the shortest line.

No. 11

Four hundred fifty years ago the people of Western Europe were getting silks, perfumes, shawls, ivory, spices and jewels from Southeastern Asia, then called the Indies.

But the Turks were conquering the countries across which the goods were carried, and it seemed likely that the trade would be stopped.

Value
6.2

In the foregoing paragraph, what was the country called from which the people of Western Europe were getting the goods named in the paragraph?

No. 12

Mrs. White and I were talking. She said to me, "Nora, I learned the other day that I am five years older than your mother."

To this I answered, "Then, Mrs. White, you are just three times as old as I am."

Nora is twelve years old. How old is her mother?

Value
7.0

No. 13

"Magnanimity in politics is not seldom the truest wisdom; and a great empire and little minds go together."
(Burke)

Study Burke's quotation carefully. If he was in favor of territorial expansion as the goal of English politicians he was a standpatter. If he believed in the establishment of justice in human relations even at the sacrifice of territorial expansion, he was a progressive. Which was he, a standpatter or a progressive?

Value
7.9

No. 14

Without making a line on paper at all, follow these instructions in your imagination. From the right-hand end of a line AB, draw a line BC at right angles to AB and half as long as AB. From the extremity of BC draw a line CD through the middle of AB, three times as long as BC. Join A and D. Do the lines in the figure inclose any surface or surfaces? If so, how many?

Value
8.3

No. 15

Value 8.9

Suppose that I have a dry sponge which weighs a half pound, and a pan of water. The pan and the water weigh three and one half pounds. I soak the sponge in the pan of water and wring it out into a pint measure until the measure is full. The pint of water weighs a pound. I now put the sponge into the pan of water and weigh the pan and its contents. What will the weight be?

No. 16

Value 52.0

At sea level water boils at 212 degrees above zero on the Fahrenheit thermometer, and at 100 degrees above zero on the Centigrade thermometer. The zero point on the Centigrade thermometer represents the same temperature as 32 degrees on the Fahrenheit thermometer. A change in temperature which would raise the mercury in a Centigrade thermometer 5 degrees would raise the mercury in a Fahrenheit thermometer how many degrees?

Directions for Scoring the Papers

1. Every answer given is counted either wholly right or wholly wrong.
2. Where the child's answer is incorrect, cross out the value indicated for that exercise in the margin.
3. Add the values of the exercises which are correctly answered. This sum is the child's score.
4. Place the score in the upper right-hand corner of the front page, in the square made for that purpose.
5. As a safeguard against teacher's misreading the exercises, the following answers are given :

Correct Answers to Some of the More Difficult Exercises

Test for Grades 3, 4, 5 :

- | | | | |
|---------|---------------|---------|--|
| No. 11. | Ans. — 8. | No. 15. | Ans. — 16. |
| No. 14. | Ans. — north. | No. 16. | Ans. — line under feather and teacher. |

Test for Grades 6, 7, 8 :

- | | | | |
|---------|-----------------------------------|---------|----------------------------|
| No. 5. | Ans. — line under if. | No. 12. | Ans. — line under success. |
| No. 10. | Ans. — cross in the large square. | No. 13. | Ans. — 2 hours. |
| No. 11. | Ans. — line under ploughman. | No. 15. | Ans. — line under compose. |
| | | No. 16. | Ans. — 30 years. |

Tests for Grades 9, 10, 11, 12 :

- | | | | |
|--------|----------------------------|---------|---------------------------------------|
| No. 2. | Ans. — snow. | No. 9. | Ans. — no. |
| No. 3. | Ans. — 1. | No. 10. | Ans. — cross above the shortest line. |
| No. 4. | Ans. — line through thief. | No. 12. | Ans. — 31 years. |
| No. 5. | Ans. — 3 miles. | No. 13. | Ans. — a progressive. |
| No. 6. | Ans. — mineral matter. | No. 14. | Ans. — 2 surfaces. |
| No. 7. | Ans. — the former. | No. 15. | Ans. — 3 pounds. |
| No. 8. | Ans. — 5 times. | No. 16. | Ans. — 9 degrees. |

The following median scores were obtained by giving the tests in May :

Grade,	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Number of children tested,	1207	1473	1535	1264	1338	912	621	487	324	91
Median score,	6.0	9.9	13.7	13.4	16.5	18.8	22.9	25.3	26.0	28.8

CHAPTER V

THE MEASUREMENT OF ABILITY IN WRITING

Essential Elements in Writing. In measuring the efficiency of writing it is necessary to ascertain the essential constituents in the process. The two prime elements of handwriting which need to be measured in order to determine a person's writing capacity are speed and quality, including under the latter legibility and form or general æsthetic appearance. Other characteristics, such as individuality, size, style, slant, etc., are of little or no importance from the practical point of view of writing as a means of communication, except in so far as they are factors in speed, quality or legibility.

Methods of Measuring. The speed of writing may be measured rather easily by ascertaining the amount that can be written in a given period of time, let us say, the number of letters per minute.

The quality of writing can be measured by either the Thorndike or the Ayres scale. The nature and derivation of these scales is described in the original sources. The Thorndike scale was constructed from 1000 samples of writing, furnished by pupils in school. These samples were arranged in the order of merit by forty or more competent judges. This resulted in a scale of graded specimens ranging in quality from 0 to 18, the former being absolutely illegible writing, but recognizable as an attempt to write, and the latter being a perfect copybook model. A given specimen of writing is measured by putting it alongside the scale and determining to what quality it is nearest.

The Ayres scale was constructed by measuring the speed of reading 1578 samples of children's writing. The words in these samples were thrown out of their natural context. These specimens were then read by ten different persons, and an average reading time was computed for each sample. Typical specimens were selected from the entire group so as to represent eight degrees of legibility. The scale in its final form consists of three samples, slant, medium and

vertical, for each of the eight degrees of legibility. The steps are designated as 20, 30, 40, 50, 60, 70, 80 and 90. Measurements are made in the same manner as with the Thorndike scale.

The convenience and accuracy of making measurements with these two scales are practically the same. To test their relative usefulness as compared with the ordinary estimates of writing made on the percentage basis, fifteen samples of children's writing were measured by twenty competent persons in three ways: (1) by the Thorndike scale, (2) by the Ayres scale and (3) by the ordinary percentile method. The results showed that the measurements made by either scale were of almost identical accuracy, and that both were much more accurate than the estimates made by the usual percentile plan.

By using both scales for rating the same samples of writing the following equivalent values for the two scales have been determined.

	THORNDIKE SCALE		AYRES SCALE
Quality	7	is equal to	22
Quality	8	is equal to	31
Quality	9	is equal to	40
Quality	10	is equal to	49
Quality	11	is equal to	58
Quality	12	is equal to	67
Quality	13	is equal to	76
Quality	14	is equal to	85

The Ayres scale does not extend as far at the lower and upper limits as the Thorndike scale. The limits of the Ayres scale lie within qualities 7 and 14 on the Thorndike scale. Quite a number of pupils in the upper grades write better than quality 14 and about half of the pupils in the first and second grades write worse than quality 7. In this regard the Thorndike scale is preferable to the Ayres scale.

Instructions for Administering the Tests. Explain to the pupils that they are to write repeatedly the line "Mary had a little lamb" as well as they can and as rapidly as they can during the two minutes that will be allowed for the writing.

Explain also that they are to write continuously without interruption and to make no erasures or corrections.

The pupils are to write with pen and ink on ruled paper. Before

THE THORNDIKE SCALE FOR HANDWRITING

4

retard on the
 curb where my
 chaperone and

5

bushes and the carriage
 moved along down the
 driveway. yes and the

6 gathering about them melted away in an instant leaving only a poor old lady

7 card, John was rished behind the bushes and the carriage moved

THE THORNDIKE SCALE FOR HANDWRITING

8 moved along down the driveway. The audience of passers-by which had been gathering about them melted away.

Then the carelessly gentleman slipped lightly into Warren's carriage and held out a small card, then vanished behind the bushes and the carriage moved

9 Then the carelessly dressed gentlemen stepped lightly into Warren's carriage and held out a small card, John vanished behind the

by which had been gathering about them melted away in an instant leaving only a poor old lady on the curb. Albert was sadly

Then the carelessly dressed gentleman stepped lightly into Warren's carriage moved and held out a small card, John vanished

THE THORNDIKE SCALE FOR HANDWRITING

10

driveaway. The audience of passers-by, which had been gathering about them melted away in an instant leaving only a poor old lady on the curb. Albert was sadly stricking

11riage moved along down the driveway. The audience of passers-by which had been gathering about them melted away along ~~the~~ down the driveway. The audience of passers-by which had been gathering about them

John vanished behind the bushes and the carriage moved along down the driveway. The audience

THE THORNDIKE SCALE FOR HANDWRITING

12 lightly into Warren's carriage and held out a small card, John vanished behind the bushes and the carriage moved along down the drive-

behind the bushes and the carriage moved along down the driveway. The audience of passers-by

Then the carelessly dressed gentlemen stepped lightly into Warren's carriage and held out a small card, John vanished behind the bushes and the

13 Then the carelessly dressed gentleman stepped lightly into Warren's carriage and held out a shield behind the bushes and the carriage moved along down the driveway. The audience of passers-by which had

Then the carelessly dressed gentleman stepped lightly into Warren's carriage and

Then the carelessly dressed gentlemen stepped lightly into Warren's carriage and

14

THE THORNDIKE SCALE FOR HANDWRITING

*Then the carelessly-dressed gentleman
stepped lightly into Warren's carriage
and held out a small card, I*

*Then the carelessly-dressed gentleman
stepped lightly into Warren's carriage and
held out a small card, John vanished behind*

15 lightly into Warren's carriage and held out a small card, John vanished behind the bushes and the carriage moved along down the drive

held out a small card, John vanished behind the bushes and the carriage moved along down the driveway The audience of passers-

John vanished behind the bushes and the carriage moved along down the driveway. The audience

Then the carelessly dressed gentle-
man stepped lightly into Warren's
carriage and held out a small white

THE THORNDIKE SCALE FOR HANDWRITING

16 *Then the carelessly dressed gentleman stepped lightly into Warren's carriage and held out a small*

gentleman stepped lightly into Warren's carriage and held out a small card, John vanished

17 Then the carelessly dressed gentleman stepped lightly into Warren's carriage and held out a small card, John vanished be-

18 showed that the rise and fall of the tides the attraction of the moon and sun upon

Beard, his trusty fowlin
and army of name h
he who demanded hat eoc
be wil descent his of

588

The greato error in Rip's composition w
kinds of profitable labor it could not be
conditioned worse tho was it yet potabls as
left more little was there until aced by a
had estate Patrimonial his through that

588

warlor xhl painting. 7
figures the of Rip remin
then in vrosz with chol
stocking vld beather and
hanger and belt broad

1886

brated have I as much
all cream and milk of bou
roasted and shad broiled
pears and peaches and plum
moreover and beef smoked
pies pumpkin and pies pear
then and cakes sweet cr.

very refused had and rider favors a
his of steel favorite been fact in
judge may we if day his in mett and fire
a of gleam the had other the but spectral
bars with knotted and tangled were tail.
neck ewe a with shaggy and parent w

It mistward evening that he
frim of weth he found thre
of unworthy as horse brake
neck, his of risk constant r
of kinds all to given annu

The appearance of Rip,
beard, his rusty fowler
and the army of name I
who demanded that eve
wilderness of his mads

1184

The hair of the affrighted ped
terror. What was to be done?
A utter not could he and no
tongue his but tune psalm to
him within sink to beg a
other his quickened however
leaving of hopes in stead hi

298

The gallant hero now up
hour at his toilet brush
his best country the in
him in devil lurking
looked he as down bro,
into spirit own his of so,
had and rider furious a ur

472

Fain would I pause to dwell
 burst upon the enraptured ge
 every to justice ample did I
 great so in not was here on
 on get to eager too am an

175

His school was a low building
 Constructed of logs the window
 partly strong the of those or
 the of back off burden the ra

176

Ichabod pride himself
 much as upon his vocal
 not a fibre about expl
 himself make to reco
 and fiction becoming

177

He entered the house, who
 had always kept in re-
 General characters large
 and hat cocked a with a
 sceptre a of instead has

1163

It is remarkable that the
 I have mentioned is not
 inhabitants of the valley
 vegetation families same
 the find still not should

175

Ishabod pride himself
 much as upon his
 himb. not a fibre abo
 hero the himself m
 his of little the in

1458

his by called city gre
 the upon eye gardia
 terprise his of scenes
 this in permitted be

100

At length he reached to us
 opened through the cliffs
 atre but no traces of her
 beard his found he actor
 same the do to involu
 gesture this of recurrence

1322

stranger's appearance
 square built familia
 are inspired that
 about incompreh

1447

The appearance of Rip, with his
rusty fowling piece, his uncor-
of name his was what an
ld hat cocked the in man
midst the in. Man another

191

As I chabod jogged
way his eye, ever o
town of culinary as
with delight Hudson

1591

On nearer approach
surprised at the su-
stranger's appearance
square built fair
and awe inspired

10.18

We had not been home long w
 was heard from the distance A
 good before way gave soon gu
 Daughters their with romped
 the with gossiped cottage and 1606

We had not been home
 of music was heard f
 of country cheer good by
 guests the of bashfuls 891

Your mere puny stre,
 at the flourish of t
 passed by with in
 claims hankers 1446

making the test, have the pupils write at the top of the sheet the name, grade, school, city and the date.

When all are ready, have them hold their pens up in the air and then give the signal "start." Allow them exactly two minutes to write over as many times as they can "Mary had a little lamb." Both speed and quality of writing count in this test.

If desired, a different sentence may be used instead of "Mary had a little lamb." The sentence must not contain more than five to seven words, which must all be familiar to the children. The pupils, however, must not have received previous drill upon it. The sentence "Art is long and time is fleeting," or any short sentence may be used.

N.B. — Make use of allowing exactly two minutes. See that all start and stop at the same time.

The time limit of two minutes is chosen because it is long enough to yield an adequate sample of writing and not too long to produce fatigue. In order to have an adequate test of speed it is necessary to use something that can be written from memory. Either copying or dictating would interfere with the natural speed of writing.

Instructions for Scoring the Tests. The samples of writing are scored for speed and quality. The speed of writing is determined by ascertaining the number of letters written per minute. The quality is measured either with the Thorndike scale or with the Ayres by what is called the ascending-descending procedure. That is, a group of thirty or forty samples is taken and each one is graded by beginning at the lower end of the scale and ascending until the quality is reached to which the sample is judged equal. After the entire group has been rated in this manner, each sample is judged again by beginning at the upper end of the scale and descending until equivalence is reached. The examiner should, of course, not know or see what the first measurement was. The average of these two determinations is taken as the final measurement. It is believed that this method yields considerably more accurate measurements than a single rating does.

The following are the standard scores, based on over 6000 pupils in 28 schools, for the ends of the respective years. The graphs in Fig. 13 represent the standard scores.

SPEED

Letters
written
per
minute

90

70

50

30

10

Grades

1

2

3

4

5

6

7

8

QUALITY

Qualities
of the
Thorndike
scale

11

10

8

7

6

Grades

1

2

3

4

5

6

7

8

FIG. 13. — Standard curves for writing.

Grades	1	2	3	4	5	6	7	8
Speed (Letters per minute)	20	31	38	47	57	65	75	83
Quality (Thorndike scale)	6.5	7.5	8.2	8.7	9.3	9.8	10.4	10.9
Quality (Ayres Scale)		27	33	37	43	53	57	

It is desirable to express a pupil's writing ability in a single score which combines speed and quality. On the principle set forth in the preceding chapter whereby speed of reading and comprehension

were made mutually convertible, speed and quality of writing may be expressed in terms of each other. We shall assume for this purpose that the growth in speed of writing from the first grade to the eighth is equal in value to the parallel growth in quality during the same time. The gain in speed of 63 letters per minute, from 20 in the first grade to 83 in the eighth grade, will be regarded equal to the gain of 4.4 steps (Thorndike scale), from 6.5 in the first grade to 10.9 in the eighth grade. On this basis, the slide-rule scale in Fig. 14 has been prepared. A pupil whose speed of writing is 41 letters per minute and whose quality of writing is 10 (Thorndike scale) would have a single score of 56 in terms of speed or 9 in terms of quality. This is obtained by finding 41 on the scale for speed and 10 on the scale for quality. The number on the speed scale opposite 10 is 70. The average of 70 and 41 is 56. In the same manner the ratings by the Ayres scale may be converted into equivalent units on the Thorndike scale, and *vice versa*.

The efficiency of a given pupil, grade or school can be represented most simply by a graph as shown in Fig. 15.

Individual Differences and the Overlapping of Grades. In connection with the reading test in the preceding chapter, we saw the extremely wide ranges of reading abilities in the various grades and the large amount of overlapping of the abilities of the pupils in one grade over the abilities of the pupils in adjacent grades. Exactly the same situation obtains in writing.

The wide range in each grade and the amount of overlapping of successive grades in quality of writing are shown in Fig. 16 for the pupils of three schools in city A. The curves in this figure represent the distribution of the pupils in each grade. They are all drawn on the same base line, so that a direct comparison can be made. The numbers along the base line are qualities of the Thorndike scale.

The pupils in the first grade range all the way from quality 4 to quality 11.5. The pupils in the eighth grade range from quality 7 to quality 15. There are five pupils in the first grade who write as well as the average in the eighth grade.

The most realistic impression of the enormous amount of overlapping can be gotten from an inspection of the curves themselves.

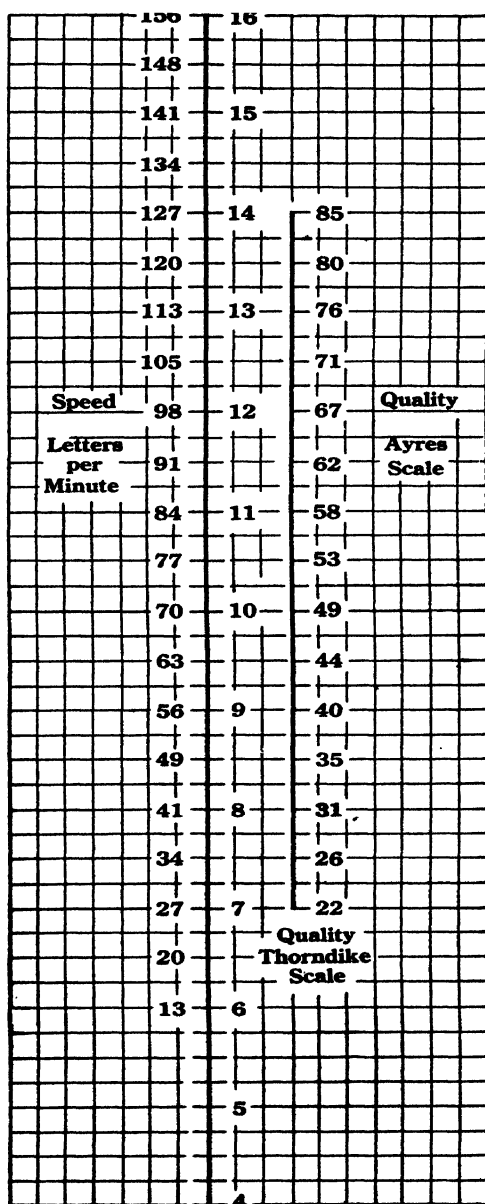


FIG. 14. — Scale for equating speed and quality of writing.

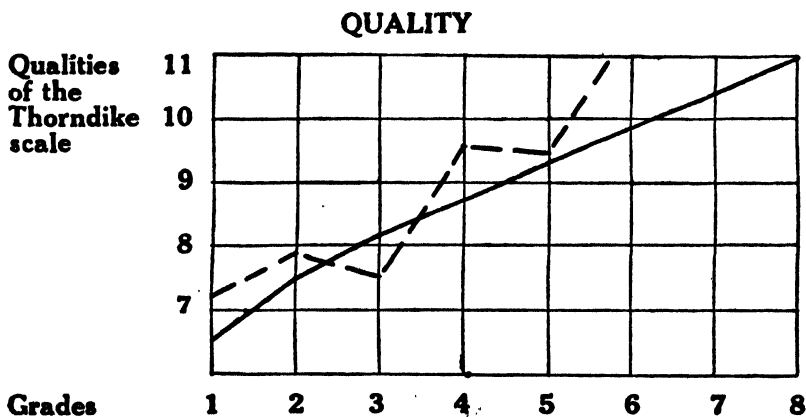
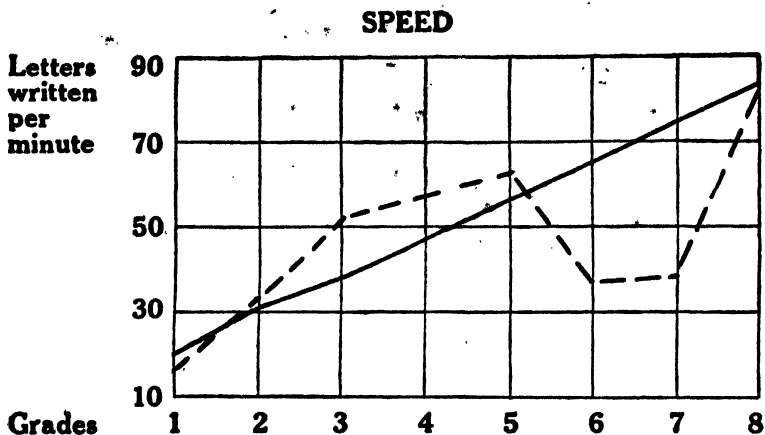


FIG. 15.— Graphs for writing, showing the comparison of a certain school with the standard curves. The continuous lines are the standard curves. The broken lines represent the school. In the sixth and seventh grades, the teacher had drilled for quality at the sacrifice of speed.

Any grade overlaps so completely over the next one that the averages of the various grades differ from each other by only small amounts. Expressing these facts in numerical terms, we find that in quality

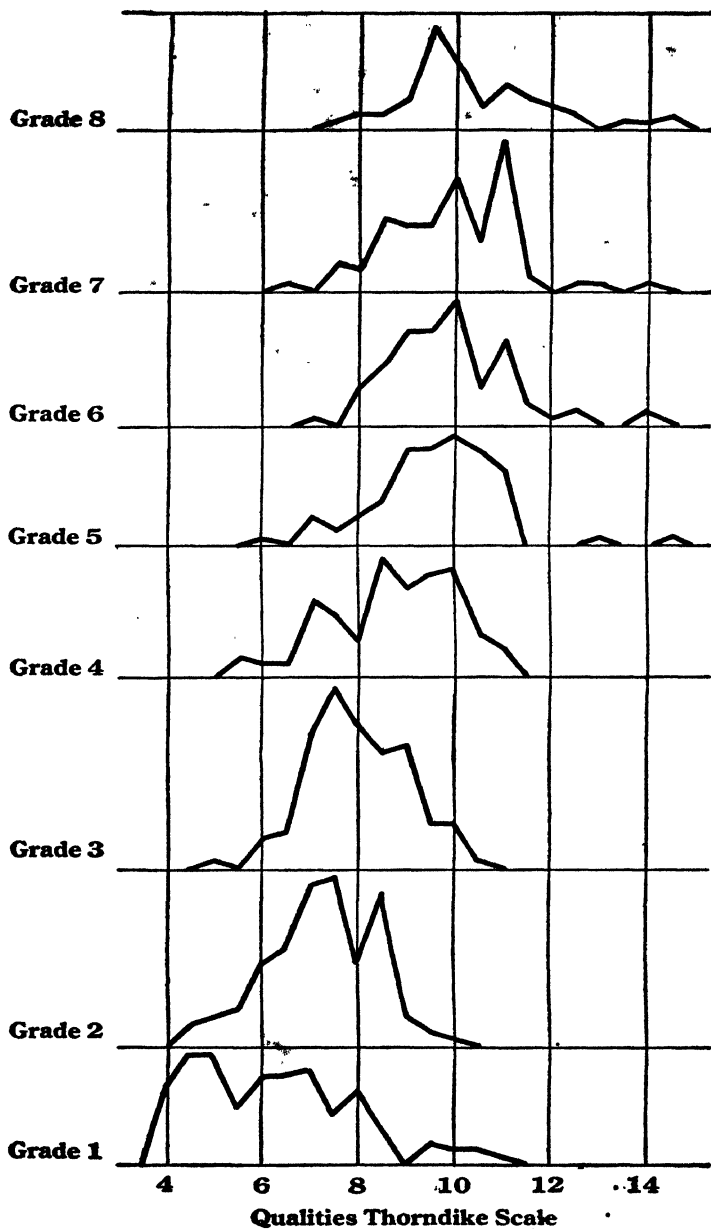


FIG. 16. — Distribution in writing of pupils in three schools.

of writing on the average 37.1 per cent of the pupils of any given grade reach or exceed the median of the next grade above it, 24.0 per cent reach or exceed the median of the second grade above it, 14.6 per cent reach or exceed the median of the third grade above it and 7.7 per cent reach or exceed the median of the fourth grade above it. Statements of the same sort apply to the speed of writing.

*Freeman's Writing Scales.*¹ Freeman has prepared a series of five short scales each for rating one of five characteristics of writing, uniformity of slant, uniformity of alignment, quality of line, letter formation, and spacing. Each scale is composed of three sets of samples representing three steps of merit in its particular element of writing. These scales will be found useful when ratings of detailed characteristics are desired. They ought to be extended by additional steps of higher and lower merit.

¹ Freeman, F. N. *The Teaching of Handwriting.* Houghton Mifflin Company.

CHAPTER VI

THE MEASUREMENT OF ABILITY IN SPELLING

Instructions for Administering the Tests. The test words for spelling are composed of six lists of one hundred words each.

First have the pupils write the name, grade, school, city, and date at the top of the sheet.

Pronounce the words clearly, but do not sound them phonetically, or inflect them so as to aid the pupils. Give the meaning of words that sound like words with a different meaning and spelling. The pupils are to write the words and to number them in the order in which they are given. Allow sufficient time for the writing.

Each grade is to be tested twice, on two successive days. Use any one of the six lists given below on the first day and a different list on the second. In the first grade use the first 40 words of the list, in the second grade use the first 65 words, in the third grade use the first 80 words, in the fourth grade use the first 90 words, and in grades five to eight use the entire list. (When an entire school is being tested it may be desirable, though not necessary, to use on the first day the same list, say list 1, in all grades and any other list on the second day.)

Instructions for Scoring the Tests. The tests are scored by checking off all words spelled incorrectly and then counting the number of words spelled correctly. This number is the score and also the percentage of words correct, since the lists contain 100 words each. An average is taken of the scores made in the two tests, which is the final score for each pupil. Omitted words are counted as incorrect. Words that may be spelled in different ways are counted correct if they are spelled according to any of the permissible ways. In the lower grades the pupils are unable to spell the omitted parts of the lists. They are therefore counted as incorrect.

List I

- | | | |
|-----------|--------------|---------------------|
| 1. add | 35. prism | 69. commence |
| 2. but | 36. rogue | 70. estimate |
| 3. get | 37. shape | 71. flourish |
| 4. low | 38. steal | 72. luckless |
| 5. rat | 39. swain | 73. national |
| 6. sun | 40. title | 74. pinnacle |
| 7. alum | 41. wheat | 75. reducent |
| 8. blow | 42. accrue | 76. standing |
| 9. cart | 43. bottom | 77. venturer |
| 10. cone | 44. chapel | 78. ascension |
| 11. easy | 45. dragon | 79. dishallow |
| 12. fell | 46. filter | 80. imposture |
| 13. foul | 47. hearse | 81. invective |
| 14. gold | 48. laden | 82. rebellion |
| 15. head | 49. milden | 83. scrimping |
| 16. kiss | 50. pilfer | 84. unalloyed |
| 17. long | 51. rabbit | 85. volunteer |
| 18. mock | 52. school | 86. cardinally |
| 19. neck | 53. shroud | 87. connective |
| 20. rest | 54. starch | 88. effrontery |
| 21. spur | 55. vanity | 89. indistinct |
| 22. then | 56. bizarre | 90. nunciature |
| 23. vile | 57. compose | 91. sphericity |
| 24. afoot | 58. dismiss | 92. attenuation |
| 25. black | 59. faction | 93. fulminating |
| 26. brush | 60. hemlock | 94. lamentation |
| 27. close | 61. leopard | 95. secretarial |
| 28. dodge | 62. omnibus | 96. apparitional |
| 29. faint | 63. procure | 97. intermissive |
| 30. force | 64. rinsing | 98. subjectively |
| 31. grape | 65. splashy | 99. inspirational |
| 32. honor | 66. torpedo | 100. ineffectuality |
| 33. mince | 67. worship | |
| 34. paint | 68. bescreen | |

List II

- | | | |
|-----------|--------------|---------------------|
| 1. air | 35. quill | 69. covenant |
| 2. cat | 36. rough | 70. eugenics |
| 3. hop | 37. shout | 71. friskful |
| 4. man | 38. stick | 72. luminous |
| 5. row | 39. swear | 73. opulence |
| 6. tap | 40. trump | 74. planchet |
| 7. awry | 41. whirl | 75. reformer |
| 8. blue | 42. action | 76. thorough |
| 9. cast | 43. bridle | 77. watering |
| 10. corn | 44. charge | 78. belonging |
| 11. envy | 45. driver | 79. displayed |
| 12. feud | 46. finger | 80. indention |
| 13. game | 47. heaven | 81. mercenary |
| 14. grow | 48. legend | 82. redevelop |
| 15. home | 49. motley | 83. senescent |
| 16. knee | 50. portal | 84. uncharged |
| 17. look | 51. recipe | 85. whichever |
| 18. mold | 52. scrape | 86. centennial |
| 19. part | 53. simple | 87. constitute |
| 20. ruin | 54. strain | 88. exaltation |
| 21. take | 55. weaken | 89. invocative |
| 22. tree | 56. breaker | 90. personable |
| 23. well | 57. congeal | 91. strawberry |
| 24. allay | 58. disturb | 92. concentrate |
| 25. blaze | 59. foreign | 93. imaginative |
| 26. buggy | 60. hoggerly | 94. mathematics |
| 27. clown | 61. meaning | 95. selfishness |
| 28. doubt | 62. onerate | 96. collectivity |
| 29. false | 63. provoke | 97. marriageable |
| 30. forth | 64. salient | 98. agriculturist |
| 31. grass | 65. station | 99. quarantinable |
| 32. house | 66. trample | 100. relinquishment |
| 33. money | 67. abstract | |
| 34. paper | 68. bulletin | |

List III

- | | | |
|-----------|--------------|---------------------|
| 1. art | 35. razor | 69. dominate |
| 2. dry | 36. saint | 70. exchange |
| 3. ice | 37. smell | 71. governor |
| 4. mix | 38. stock | 72. manifest |
| 5. run | 39. swoop | 73. osculate |
| 6. top | 40. twine | 74. pleasure |
| 7. back | 41. white | 75. revising |
| 8. bond | 42. barrel | 76. traverse |
| 9. chip | 43. buckle | 77. westward |
| 10. crib | 44. cotton | 78. capitally |
| 11. ever | 45. engine | 79. extremism |
| 12. fire | 46. flimsy | 80. indicated |
| 13. guilt | 47. helmet | 81. monoplane |
| 14. hack | 48. lesser | 82. repertory |
| 15. hunt | 49. ocular | 83. stimulate |
| 16. lace | 50. potato | 84. unlocated |
| 17. main | 51. relate | 85. accidental |
| 18. more | 52. season | 86. citizenize |
| 19. pelt | 53. single | 87. contribute |
| 20. sand | 54. supply | 88. expertness |
| 21. tang | 55. weight | 89. locomotive |
| 22. turn | 56. captain | 90. prevailing |
| 23. wine | 57. contour | 91. symmetrize |
| 24. amuse | 58. earnest | 92. consolatory |
| 25. blind | 59. fowling | 93. incremental |
| 26. catch | 60. inflate | 94. penetrative |
| 27. count | 61. measure | 95. superintend |
| 28. dress | 62. palaver | 96. conterminous |
| 29. fancy | 63. raising | 97. naturalistic |
| 30. freak | 64. seizing | 98. artificiality |
| 31. gross | 65. sulphur | 99. re-examination |
| 32. inlet | 66. trestle | 100. sentimentalism |
| 33. muddy | 67. adhesive | |
| 34. peace | 68. buttress | |

List IV

- | | | |
|-----------|--------------|---------------------|
| 1. bee | 35. remit | 69. enabling |
| 2. elk | 36. scale | 70. external |
| 3. key | 37. speak | 71. greeting |
| 4. new | 38. stone | 72. mosquito |
| 5. saw | 39. thick | 73. outfling |
| 6. war | 40. under | 74. positive |
| 7. base | 41. widen | 75. romantic |
| 8. book | 42. bearer | 76. undulate |
| 9. clue | 43. canine | 77. adverbial |
| 10. down | 44. create | 78. carpentry |
| 11. fall | 45. craser | 79. franchise |
| 12. flat | 46. garret | 80. infatuate |
| 13. girt | 47. hollow | 81. promenade |
| 14. hand | 48. little | 82. rigmarole |
| 15. iron | 49. office | 83. strippling |
| 16. lime | 50. prince | 84. vegetable |
| 17. make | 51. retain | 85. assignment |
| 18. move | 52. settle | 86. comparison |
| 19. plug | 53. sluice | 87. coördinate |
| 20. shop | 54. swerve | 88. expressage |
| 21. tear | 55. withal | 89. mayonnaise |
| 22. tusk | 56. chicken | 90. recompense |
| 23. wire | 57. counter | 91. untraveled |
| 24. apple | 58. emperor | 92. consumptive |
| 25. blood | 59. freight | 93. infuriation |
| 26. chain | 60. journal | 94. photosphere |
| 27. craft | 61. neglect | 95. terrestrial |
| 28. drawn | 62. passion | 96. horsemanship |
| 29. field | 63. reserve | 97. regenerative |
| 30. frost | 64. serpent | 98. circumscribed |
| 31. guard | 65. surface | 99. sculpturesque |
| 32. jelly | 66. trouble | 100. verisimilitude |
| 33. ocean | 67. affected | |
| 34. pitch | 68. calendar | |

LIST V

- | | | |
|-----------|--------------|----------------------|
| 1. bow | 35. revel | 69. entirely |
| 2. fly | 36. scorn | 70. farewell |
| 3. law | 37. spire | 71. incident |
| 4. old | 38. strut | 72. mountain |
| 5. see | 39. three | 73. parallel |
| 6. ache | 40. voice | 74. prelimit |
| 7. bead | 41. wince | 75. spectral |
| 8. call | 42. beaver | 76. urbanize |
| 9. cold | 43. cannon | 77. aggrieved |
| 10. draw | 44. crispy | 78. clarifier |
| 11. fast | 45. escape | 79. hydraulic |
| 12. foil | 46. gladly | 80. inheritor |
| 13. glue | 47. hustle | 81. purgation |
| 14. hard | 48. mallet | 82. sacrifice |
| 15. jack | 49. oriole | 83. surviving |
| 16. line | 50. pulley | 84. vestibule |
| 17. mark | 51. rubric | 85. authorship |
| 18. musk | 52. shears | 86. concoction |
| 19. prig | 53. solace | 87. derigation |
| 20. slat | 54. trifle | 88. federative |
| 21. test | 55. yellow | 89. memorandum |
| 22. vend | 56. circuit | 90. regularity |
| 23. wood | 57. crooked | 91. abnormality |
| 24. armor | 58. enstamp | 92. disseminate |
| 25. boast | 59. general | 93. insensitive |
| 26. chase | 60. lateral | 94. predominate |
| 27. cross | 61. nourish | 95. unprevented |
| 28. enjoy | 62. placard | 96. inarticulate |
| 29. fixed | 63. resolve | 97. stupendously |
| 30. glean | 64. signify | 98. communicating |
| 31. guild | 65. tabloid | 99. anthropometric |
| 32. joint | 66. unitive | 100. emancipationist |
| 33. order | 67. approved | |
| 34. point | 68. cerebral | |

List VI

- | | | |
|-----------|--------------|-----------------------|
| 1. box | 35. river | 69. erodible |
| 2. gap | 36. shaft | 70. fetching |
| 3. lay | 37. stall | 71. juncture |
| 4. pod | 38. sugar | 72. narcotic |
| 5. sex | 39. throw | 73. parasite |
| 6. alms | 40. watch | 74. probator |
| 7. bird | 41. young | 75. squeaker |
| 8. camp | 42. begird | 76. vagabond |
| 9. comb | 43. causal | 77. amphibian |
| 10. dusk | 44. discuss | 78. clearness |
| 11. fear | 45. ferret | 79. impatient |
| 12. foot | 46. gutter | 80. intestine |
| 13. goat | 47. killed | 81. quadruple |
| 14. hawk | 48. middle | 82. sauciness |
| 15. keep | 49. paddle | 83. ticketing |
| 16. life | 50. puzzle | 84. virulence |
| 17. mass | 51. sample | 85. bafflement |
| 18. navy | 52. shield | 86. condescend |
| 19. raft | 53. spring | 87. disconcert |
| 20. some | 54. tubule | 88. illiterate |
| 21. that | 55. bicycle | 89. metropolis |
| 22. vice | 56. commode | 90. repression |
| 23. work | 57. discard | 91. animalcular |
| 24. aside | 58. excuser | 92. divestiture |
| 25. brawn | 59. gravity | 93. intrinsic |
| 26. chime | 60. leaping | 94. prerogative |
| 27. crown | 61. obloquy | 95. upholsterer |
| 28. equip | 62. pontiff | 96. interference |
| 29. flock | 63. retreat | 97. subantarctic |
| 30. grand | 64. society | 98. convocational |
| 31. hedge | 65. tigress | 99. imperturbation |
| 32. knock | 66. vitiate | 100. irresponsibility |
| 33. ought | 67. auditory | |
| 34. poppy | 68. churlish | |

The words in these lists were selected in the following manner: The first defined word on every even-numbered page in Webster's New International Dictionary (1910 edition) was chosen, making a total of 1186 words. From these all technical, scientific and obsolete words were discarded, which left 612 words. Finally, 12 other words which approached most closely to being technical or obsolete were discarded, so as to leave 600 words. These were then arranged alphabetically in the order of size, beginning with 3-letter words, 4-letter words, etc., down to the longest words. This list was then divided into six lists of 100 words each by choosing for the first list, the 1st, 7th, 13th, etc.; for the second list, the 2d, 8th, 14th, etc.; for the third list, the 3d, 9th, 15th, etc.; for the fourth list, the 4th, 10th, 16th, etc.; for the fifth list, the 5th, 11th, 17th, etc.; and for the sixth list, the 6th, 12th, 18th, etc.

The reasons for selecting the words on this particular basis were:

- (1) It would give a random sampling of the entire non-technical English vocabulary. Familiar or unfamiliar words, large or small words, hard or difficult words, would all be included in the test lists in the same proportions in which they occur in the entire vocabulary.
- (2) This selection would give a list including a fair sampling of very easy and very difficult words, so that it could be used for testing the spelling capacity of the beginner as well as that of the expert speller.
- (3) It would yield a list sufficiently large for testing adequately any child's spelling ability.
- (4) It would give a list that could be duplicated in the same manner by any one else, if, for some reason, it should be desired to have a different but comparable list. Similar lists of 100 words each could be constructed, for example, by selecting the 2d, 3d or any other word on the even- or odd-numbered pages of Webster's New International Dictionary and then discarding words in the manner described above so as to leave 600 words.
- (5) The particular score that a pupil makes in the test has a definite meaning in that it indicates the percentage of words of the entire non-technical English vocabulary that he is able to spell. If a pupil can spell 50 words out of any list, he can spell 50 per cent of the non-technical vocabulary or approximately 26,000 words.

The validity of this method of measuring spelling ability has been examined from various angles. Experimentation has shown that

the spelling ability of any individual pupil can be ascertained accurately by the use of any two lists, preferably at two different times. If a pupil is tested with one list at one time and soon afterwards with a second list, the two scores will differ from each other by a mean variation of only 2.2 points.

To ascertain in another way the reliability of the tests, a comparison was made between the ability in spelling as measured for each pupil by two lists and the marks assigned by the teachers to the pupils

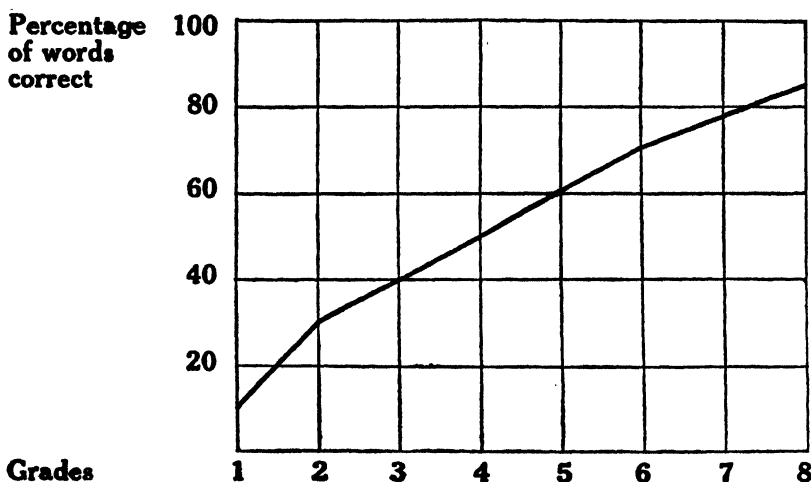


FIG. 17. — Standard curve for spelling.

Standard scores on which the above curve is based

Grades	1	2	3	4	5	6	7	8
Percentage of words correct	10	30	40	51	61	71	78	85

for the year's work in spelling. Coefficients of correlation were computed between the teachers' marks and the test scores. These were found to be high and indicated a close agreement between the scores in the tests and the teachers' estimates of the pupils' achievement in spelling, even at the end of a whole year of instruction and observation.

Further experiments were made to determine the relative difficulty of the six lists. For practical purposes the differences among the six lists are negligible.

Standards of Efficiency in Spelling. The following are tentative standard scores which have been derived from tests made on over

2500 pupils, Fig. 17. The attainment in spelling of a pupil, class or school can be determined by comparisons with the standards.

Individual Differences and the Overlapping of Grades. The spelling tests reveal identically the same facts concerning the distribution of the pupils and the overlapping of the grades as were found in case of the reading and writing tests. The facts are pre-

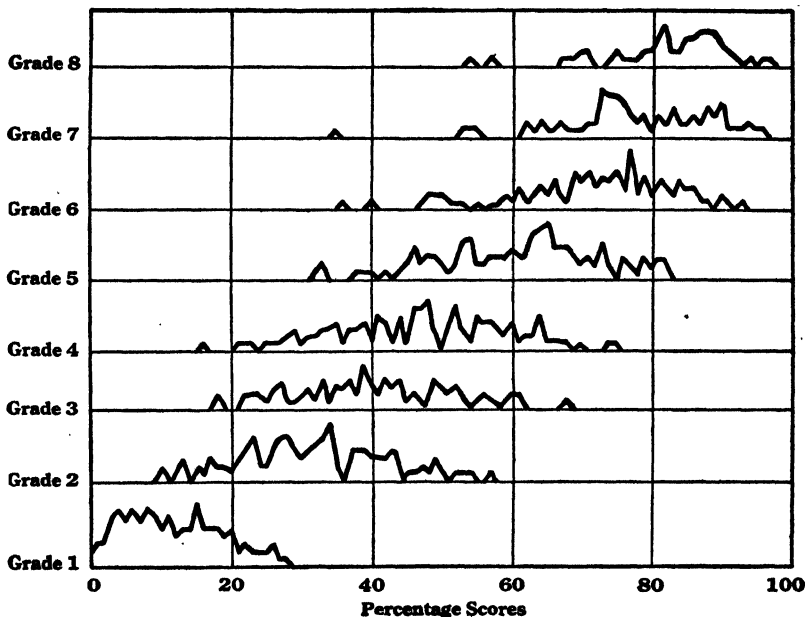


FIG. 18. — Distribution in spelling ability of pupils in two schools.

sented in the curves of Fig. 18. The numbers along the base line are the percentage scores made in spelling, and the vertical distances indicate the number of pupils.

The overlapping among the various grades is enormous. There are two pupils in the second grade who can spell as well as two pupils in the eighth grade. Other comparisons of a similar kind can be made. On the average 20.8 per cent of the pupils in any grade reach or exceed the median of the next grade above it, and 6.2 per cent reach or exceed the median of the second grade above it.

Ayres' 1000 Commonest Words. This list, which has been pre-

pared after much experimentation as a spelling test, is composed of the 1000 most common words. The nature and use of the lists are stated by Ayres as follows :

All the words in each column are of approximately equal spelling difficulty. The steps in spelling difficulty from each column to the next are approximately equal steps. The numbers at the top indicate about what per cent of correct spellings may be expected among the children of the different grades. For example, if 20 words from column H are given as a spelling test it may be expected that the average score for an entire second grade spelling them will be about 79 per cent. For a third grade it should be about 92 per cent, for a fourth grade about 98 per cent, and for a fifth grade about 100 per cent.

The limits of the groups are as follows: 50 means from 46 through 54 per cent; 58 means from 55 through 62 per cent; 66 means from 63 through 69 per cent; 73 means from 70 through 76 per cent; 79 means from 77 through 81 per cent; 84 means from 82 through 86 per cent; 88 means from 87 through 90 per cent; 92 means from 91 through 93 per cent; 94 means 94 and 95 per cent; 96 means 96 and 97 per cent; while 98, 99 and 100 per cent are separate groups.

By means of these groupings a child's spelling ability may be located in terms of grades. Thus if a child were given a 20 word spelling test from the words of column O and spelled 15 words, or 75 per cent of them, correctly it would be proper to say that he showed fourth grade spelling ability. If he spelled correctly 17 words, or 85 per cent, he would show fifth grade ability, and so on.

Ayres' Short List. This list is composed of a set of ten words for each grade from the second to the eighth. Each set of ten was so selected, on the basis of previous tests, that seven out of ten children of a grade on an average can spell correctly all the words designed for that grade. The lists are as follows :

2D GRADE	3D GRADE	4TH GRADE	5TH GRADE	6TH GRADE	7TH GRADE	8TH GRADE
foot	fill	forty	several	decide	district	petrified
get	point	rate	leaving	general	consideration	tariff
for	state	children	publish	manner	athletic	emergency
horse	ready	prison	o'clock	too	distinguish	corporation
cut	almost	title	running	automob.	evidence	convenience
well	high	getting	known	victim	conference	receipt
name	event	need	secure	hospital	amendment	cordially
room	done	throw	wait	neither	liquor	discussion
left	pass	feel	manner	toward	experience	appreciate
with	Tuesday	speak	flight	business	receive	decision

There are, however, three points that should be considered. (1) The lists are so small that the chance of familiarity or unfamiliarity on the part of individual pupils with these particular words is rather

large. The result is that, while the words no doubt have validity for testing a grade or class as a whole, they are apt to be quite unreliable as a test of individual pupils. (2) As a result of the manner in which the words were selected, they are sure to be too easy for the better pupils of each grade, and hence they would not test the spelling ability of such pupils. By definition, seven out of ten pupils can spell correctly all the words assigned to their grade.

Buckingham's List. Buckingham selected, on the basis of a series of tests, two lists of twenty-five words each of known difficulty. These are arranged on a scale of increasing value as follows :

1ST LIST		2D LIST	
only	freeze	chicken	against
even	forty	butcher	circus
smoke	wear	Tuesday	guess
front	minute	answer	telephone
another	pear	raise	choose
lesson	button	beautiful	telegram
bought	janitor	instead	saucy
pretty	sword	tailor	already
nails	whistle	tying	pigeons
sure	stopping	towel	beginning
nor	carriage	tobacco	grease
cousin	saucer	whole	too
touch		quarrel	

The relative values of these words have been determined quite accurately. A child's spelling capacity would be measured by determining the number of words he can spell correctly and then assigning to him a score on the basis of the values of the words spelled. Criticisms (1) and (2) made in connection with the Ayres short list apply here also. The words are too easy for the better pupils even as far down as the fourth grade. In the upper grades more and more of the pupils can spell correctly all the words in the list until in the eighth grade more than half of the pupils can spell all of the words correctly. The list should be extended by selecting words of greater difficulty.

CHAPTER VII

THE MEASUREMENT OF ABILITY IN ENGLISH GRAMMAR

THE measurement of achievement in English grammar may be attacked from two angles. We may proceed to measure knowledge of formal grammar on the one hand, or ability to use the English language correctly on the other. Measurements for both phases have been prepared. The scales for measuring usage will be described first and the tests for knowledge of technical grammar afterwards.

Scales for Measuring Usage

The two chief elements of usage, aside from composition, are undoubtedly grammatical correctness and punctuation. Accordingly, a scale has been prepared for measuring grammatical correctness and one for measuring ability in punctuation.

GRAMMATICAL SCALE A¹

(Prepared by D. Starch)

Each of the following sentences gives in parenthesis two ways in which it may be stated. Cross out the one that you think is incorrect or bad. If you think both are incorrect cross both out. If you think both are correct underline both.

Step 5

1. It was so misty we (could hardly; couldn't hardly) see.
2. The gazette reported (he; him) to be dead.
3. He was a patriot, but all the rest (were traitors; traitors).

Step 6

1. On the way we met a Mr. Osborn from the neighborhood of Denver, (and who; who) had the typical western breeziness.
2. Gravity is (when a stone falls; a force that causes a stone to fall) to the ground.

¹ Copies of the tests in this chapter may be obtained from the author in desired quantities.

- 3. I can do it as well as (they; them).
- 4. It is (me; I).

Step 7

- 1. A fireman seldom rises above (an engineer; the position of an engineer).
- 2. The difference between summer and winter (is that; is) summer is warm and winter is cold.
- 3. He is happier than (me; I).
- 4. They are (allowed; not allowed) to go only on Saturdays.

Step 8

- 1. (In; as I was) talking to Smith the other day, he told me about the race.
- 2. (When I was; when) six years old, my grandfather died.
- 3. You must not cut the cake until (thoroughly cooked; it is thoroughly cooked).
- 4. I shall always remember the town because of (the good times I had; the good times) and the many friends I made there.

Step 9

- 1. It tastes (good; well).
- 2. Send (whoever; whomever) will do the work.
- 3. (Who; whom) do you mean?
- 4. You (will; shall) not stir; I forbid it.

Step 10

- 1. I intended (to answer; to have answered).
- 2. I met many people there whom I had seen before (but did not know their names; whose names I did not know).
- 3. I (will; shall) help you; I promise it.
- 4. Having come of age, (I took my son; my son entered) into partnership with me.

Step 11

- 1. It was not necessary for you (to have gone; to go).
- 2. There were some people (whom; about whom) I could not tell whether they were English or American.
- 3. He came home with an increase in weight, but (hard work soon reduced it; which hard work soon reduced).
- 4. A different set of knives and forks (was; were) put on the table.

Step 12

- 1. The sheets of tin are laid in rows, (and care is taken; with care) that all the sheets fit snugly.

2. (Lincoln's assassination; the assassination of Lincoln) was a great tragedy.
3. He is (not only discourteous; discourteous not only) to the students but also to the teachers.
4. He had no love (or confidence in his employer; for his employer and no confidence in him).

Step 14

1. The man (whom; who) I thought was my friend deceived me.
2. (He sprang; springing) to the platform on which the dead man lay (and shouted; he shouted).
3. (Shall; will) you be recognized, do you think?

Step 15

1. They returned at night without any (one's; one) seeing.

Step 16

1. A man who (would; should) do that would be hated.
2. Do you (expect ever; ever expect) to go again?

Name..... Date.....

School..... Grade.....

City.....

Scoring the Test. The scale is composed of a series of increasing steps of equal differences of difficulty. A pupil's rating on the scale is the highest step passed and a step is passed if not more than one of the four sentences is missed. In case a pupil passes all the steps up to a certain point and then fails on one but passes additional steps beyond that point, he is credited with all the additional steps passed. For example, if a pupil passes all steps up to and including the 8th and fails on all beyond the 8th, his score will be 8. But if he fails on the 9th, passes the 10th, and then fails on the rest, his score will be 9. He is credited with all additional steps passed. This sort of a record occurs about once in five and is due to the fact that there are only four sentences in each step. If there were ten or twelve sentences in each step such a record would rarely if ever occur. The reasons for regarding a step passed if 3 of the 4 sentences are marked correctly, that is, 75 per cent of them, will be obvious to all who are

familiar with the principles underlying the psychological methods of measuring thresholds.

Derivation of the Scale. Grammatical scale A was derived experimentally by preparing a test sheet containing 100 sentences of a similar nature as those in the scale. A test was then conducted with over 1000 pupils in six schools in various parts of the country distributed about evenly through the upper four grades the four years of the high school and the university. These tests were scored and tabulated to show the percentage of times each sentence was marked correctly.

On the basis of these percentages of correctness, the sentences for scale A were selected as described elsewhere. Four sentences which conformed to the required percentages of correctness for each step, were selected and arranged in the form of scale A. The sentences, of course, do not have absolutely these values, but they were selected to conform as closely as possible. In no case, however, does a sentence deviate more than .2 of a step from its required value. The scale runs down only as far as step 5 because there were no sentences in the original test blank sufficiently easy to fit the required percentages of correctness for lower steps. Some of the upper steps have fewer than four sentences because there were not enough sentences of the proper degree of difficulty to fit into these higher steps. The scale, however, as it stands is sufficiently easy at the lower end to measure adequately the ability of pupils in the lower grades and sufficiently difficult at the upper end to measure adequately the ability of university seniors.

Advantages, Limitations and Improvements of the Scale. The limitations of the scale are the incompleteness of the steps at the upper and lower ends and the fact of having only four sentences for each step. The former limitation is of minor importance since the scale in its present form is sufficiently extensive to measure a very wide range of ability. The scale will be extended at both ends by further experimentation so as to add sentences of the required degrees of difficulty.

The second limitation can be overcome experimentally by finding additional sentences for each step. This has been done by preparing scales B and C with corresponding steps of identical degrees

of difficulty. Scales B and C were constructed by the same process as scale A. The sentences in scales B and C, however, do not fit into their respective steps as accurately as those in scale A. While each group of 4 sentences as a whole is very nearly identical in difficulty with the corresponding steps in scale A, some individual sentences deviate .3 of a step from the specified values.

GRAMMATICAL SCALE B

(Prepared by D. Starch)

Each of the following sentences gives in parenthesis two ways in which it may be stated. Cross out the one that you think is incorrect or bad. If you think both are incorrect, cross both out. If you think both are correct, underline both.

Step 7

1. I feared you (should; would) fail.
2. Any man who could accomplish that task, the whole world would (think he was a hero; regard as a hero).
3. He had to earn money (that is; is) the reason he stayed out of college.
4. He went to school (thereby; and thereby) improving his mind.

Step 8

1. The fact that I had never before studied at home, (I was at a loss; made me feel at a loss as to) what to do with vacant periods.
2. Both are going, — (he and she; him and her).
3. I don't believe I (will; shall) be able to go.
4. It is (the handsomest vase I almost; almost the handsomest vase I) ever saw.

Step 9

1. We ate such a dinner as only laborers (can eat; can).
2. He was deaf, (caused by; as the result of) an early attack of scarlet fever.
3. I asked what were the names of her puppies and (kitten; her kitten).
4. Every one opened (his; their) window.

Step 10

1. The captain, as well as the mate and the pilot, (was; were) frightened.

2. (That's all I want, is a chance; that's all I want — a chance) to test it thoroughly.
3. He is the tallest of (all the men; any man) in the regiment.
4. (I walked out into the night as the moon rose; as the moon rose, I walked out into the night) and wandered through the grounds.

Step 11

1. There we landed, and having eaten our lunch (the steamboat departed; we saw the steamboat depart).
2. (After pointing; when he had pointed) out my errors, I was dismissed.
3. The question of (whom; who) should be leader arose.
4. He spoke to some of us, — namely (she and I; her and me).

Step 12

1. It has no relation (to; as to) time or place.
2. He left for Pittsburgh on Thursday (arriving; and arrived) there on Sunday.
3. Fostoria is as large (if not larger than Delaware; as Delaware, if not larger).
4. He kept it (safe; safely). (That is, through his keeping, it was safe).

Name Date

School Grade

City

GRAMMATICAL SCALE C

(Prepared by D. Starch)

Each of the following sentences gives in parenthesis two ways in which it may be stated. Cross out the one that you think is incorrect or bad. If you think both are incorrect, cross both out. If you think both are correct, underline both.

Step 7

1. The life of a hod-carrier is sometimes happier than (a prince; that of a prince).
2. (There were two hundred; two hundred) students went.
3. He wrapped it (tight; tightly). (Referring to the manner of wrapping.)
4. He did what many others (have; have done) and are doing.

Step 8

1. The fire was built and the potatoes (baked ; were baked).
2. I was detained by business (is ; that is) the reason I am late.
3. The difference between them (is ; is that) De Quincey is humorous and Macaulay is grave.
4. (Shall ; will) you do the deed ?

Step 9

1. The box, including the apples, (were ; was) lost.
2. Oak, brass, and steel (is ; are) the material of the structure.
3. The ball is thrown home by a player (stationed in the middle of the square called the pitcher ; called the pitcher, who is stationed in the middle of the square).
4. I paddled the boat for a while, (then ; and then) fell into a reverie.

Step 10

1. If they (would ; should) find it, I should rejoice.
2. One or the other of those fellows (have ; has) stolen it.
3. I went there in order to (inspect it personally ; personally inspect it).
4. They would neither speak to him (nor would they ; nor) look at him.

Step 11

1. A new order of ideas and principles (have ; has) been instituted.
2. Every morning I take a run (and immediately afterward ; followed by) a shower bath.
3. (The benefactor of mankind ; mankind's benefactor) is honored by all.
4. (Who ; whom) did you say won ?

Name..... Date.....

School..... Grade.....

City of.....

The advantage in the three scales is that whenever a more accurate measurement is desired than that afforded by a single test, more than one scale may be used and an average of the scores taken.

Another advantage in having several commensurate scales is the measurement of progress of the same class of pupils from time to time by using a different scale each time. As a matter of fact,

progress may be measured very accurately by using the same scale at different times, providing that no drilling or coaching on the scale is done. Without specific instruction on the material of the scales, they may be used repeatedly with the same class without appreciable error. The following situation illustrates how little effect even definite knowledge of the correctness of the various sentences has upon the results of repeated tests. A class of 65 university juniors and seniors went through the test and scored according to a key their own papers and from 6 to 10 other papers each. Three weeks later the test was repeated, with the result that the average score of the class was only half a step higher than in the first test. When specific knowledge about the material of the scale produces so little difference after only three weeks, it seems very improbable that the performance of the test without further reference to it will have any appreciable effect whatever upon a repetition of the test after an interval of several weeks or months.

Standards of Attainment. On the basis of tests made in four schools, the following tentative standards of attainment for the ends of the respective years have been obtained.

Grade Score	Grades		High School				University
	7	8	1	2	3	4	3
	.0	8.3	8.6	8.9	9.2	9.5	10.3

PUNCTUATION SCALE A

(Prepared by D. Starch)

Punctuate the following sentences.

Step 6

1. We visited New York the largest city in America.
2. Everything being ready the guard blew his horn.
3. There were blue green and red flags.
4. If you come bring my book.

Step 7

1. I told him but he would not listen.
2. Concerning the election there is one fact of much importance.
3. The guests having departed we closed the door.
4. The train moved swiftly but Turner arrived too late.

Step 8

1. Last year I studied grammar history and geography.
2. Next we went to Vienna the capital of Austria.
3. But alas this was not the case.
4. Ever since Betty has loved the flag.

Step 9

1. He was satisfied I suppose with his situation.
2. A faithful sincere friend is prized highly.
3. The present situation however is very different.
4. Our national Capitol situated in Washington is a magnificent building.

Step 10

1. A tall square building is located on State street.
2. Washington Irving whose personality was genial and charming became very popular in England.
3. You see John how I stand.
4. On the path leading to the cellar steps were heard.

Step 11

1. Paris Illinois is a smaller city than Paris France.
2. He asked what is the matter.
3. I like to work he said especially in the morning.
4. Chicago Illinois is a large city.

Step 12

1. When thou goest forth by day my bullet shall whistle past thee when thou liest down by night my knife is at thy throat.
2. Oh come you'd better.
3. The president bowed then Hughes began to speak.

Step 13

1. I saw no reason for moving therefore I stayed still.
2. There are three causes poverty injustice and indolence.

Step 14

1. He said that he had lent his neighbor an ax that on the next day needing the ax he had gone to get it and that his neighbor had denied borrowing it.

Step 16

1. As in warfare a band of men though strong and brave individually is collectively weak if it is not well organized so a speech a report an editorial an essay any composition

though its parts may be forcible or clever is weak as a whole if it is not well organized.

Name.....Date.....

School.....Grade.....

City.....

The scale for punctuation was derived by a process of experimentation and computation entirely identical with that by which the grammatical scales were derived. The original test with a larger set of sentences was made with the same groups of pupils as the grammatical tests, over 1000 in all. The number and percentage of times each sentence was punctuated correctly was then computed, and the selection of sentences for the scale was made on the same principles as for the grammatical scales.

The scoring is done in the same manner as with the grammatical scales. A step is passed if at least three of the four sentences are punctuated correctly. If any mark is inserted incorrectly or is missing, the entire sentence is considered a failure.

With regard to use, advantages, limitations and improvements of the punctuation scale, the statements made in connection with the grammatical scales apply here equally well, and hence need not be repeated.

The following are tentative standard scores of attainment for the ends of the respective school years :

	Grades		High School				University
Grade	7	8	1	2	3	4	3
Score	8.0	8.3	8.6	8.9	9.2	9.5	10.3

Tests for Measuring Grammatical Knowledge

The technical knowledge of grammar is perhaps more difficult to measure than usage on account of its complexity. Adequate tests should cover the chief parts of the field. Three types of tests will be described. They do not cover all phases of grammar, but they measure several important divisions.

GRAMMAR TEST 1. PARTS OF SPEECH. SCORE-----

Indicate the parts of speech in the following text by placing above each word the abbreviation for its part of speech. Work as rapidly as possible. Do not

skip any words. Three minutes will be allowed. Use the following abbreviations.

noun — n	verb — v	conjunction — c
pronoun — pro	adverb — adv	interjection — i
adjective — adj	preposition — pre	

Maggie's eyes had begun to sparkle and her cheeks to flush — she was really beginning to instruct the gypsies and gaining great influence over them. The gypsies themselves were not without amazement at this talk, though their attention was divided by the contents of Maggie's pocket, which the friend at her right hand by this time emptied without attracting her notice.

"Is that where you live, my little lady?" said the old woman at the mention of Columbus.

"Oh, no!" said Maggie, with some pity; "Columbus was a very wonderful man who found out half the world, and they put chains on him and treated him very badly, you know — it's in my catechism of geography but perhaps it's rather too long to tell before tea."

"Yes, my home is pretty, and I'm very fond of the river where we go fishing; but I'm often very unhappy. I should have liked to bring my books with me, but I came away in a hurry, you know. But I can tell you almost everything there is in my books, I've read them so many times, and that will amuse you. And I can tell you something about geography, too — that's about the world we live in — very useful and interesting."

This test is scored by determining the number of words designated correctly. If a word may be designated in different ways, it is counted correct if it is permissible according to good authority. For example, Maggie's is considered correct if it is marked as either noun or adjective.

The following are provisional standard scores of achievement for the ends of the various school years.

	Grades		High School			University
Grade	7	8	1	2	3	4
Score	30	33	36	40	43	46
						60

GRAMMAR TEST 2. ES SCORE-----

Indicate the case of each noun and each pronoun in the following text by placing above each one the abbreviation for its case. Be careful not to omit any nouns or pronouns. Work as rapidly as possible. Three minutes will be allowed. Use the following abbreviations:

nominative — n	possessive — p	objective — o
----------------	----------------	---------------

After crossing the gully and walking on through the woods for what they thought a safe distance, they turned into the path. They were talking very merrily about the General and Hugh and their friend Mills, and were discussing some romantic plan for the recapture of their horses from the enemy when they came out of the path into the road, and found themselves within twenty yards of a group of Federal soldiers, quietly sitting on their horses, evidently guarding the road.

"Where are you boys going?" he asked, as he came up to them.

"Going home."

"Where do you belong?"

"Over there — at Oakland," pointing in the direction of their home, which seemed suddenly to have moved a thousand miles away.

"Where have you been?" The other soldiers had come up now.

"Been down this way." The boys' voices were never so meek before. Each reply was like an apology.

"Been to see your brother?" asked one who had not spoken before — a pleasant-looking fellow. The boys looked at him. They were paralyzed by dread of the approaching question.

"Now, boys, we know where you have been," said a small fellow, who wore a yellow chevron on his arm. He had a thin mustache and a sharp nose, and rode a wiry, dull, sorrel horse. "You may just as well tell us all about it. We know you have seen them, and we are going to make you carry us where they are."

This test is scored by determining the total number of nouns and pronouns designated correctly. The following are provisional standard scores.

	Grades		High School				University
Grade	7	8	1	2	3	4	3
Score	13	16	20	23	26	30	45

GRAMMAR TEST 3. TENSES AND MODES. SCORE-----

Indicate the tense and the mode of the following verb forms by placing above each example the abbreviation for its tense and mode. Work as rapidly as possible. Three minutes will be allowed. Use the following abbreviations.

present — pr.

past — pa.

future — fu.

present perfect — pr. p.

past perfect — pa. p.

future perfect — fu. p.

indicative mode — in.

subjunctive mode — su.

imperative mode — im.

If a verb has the present tense and the indicative mode, place above it *pr. in.*

I wait. I will have cut. You talked. If you become. He will think. If he wished. We have played. Break the stick. They had shown. I stayed. If I drink. You will look. If you found. He has walked. Do your work. We had spun. We cry. They will have run. I will grow. If I punished. You have seemed. Wear your hat. He has. He had called. We will have slept. If they begin. We gave. I have eaten. Seek your pencil. You had seen. He spoke. He will have fallen. We will take. If we drive. If they drew. You depart. They sell. I had flown. They bought. You will have been. They will swim. If he go. They have stolen. If we bit. Lift your hat.

A tense or a mode given correctly counts as one point. Every verb form for which both are given correctly counts as two points. The total number designated correctly constitutes the score. The following are provisional standard scores.

	Grades		High School				University
Grade	7	8	1	2	3	4	3
Score	13	16	20	23	26	30	45

Limitations and Improvements of the Tests. The two chief limitations of these tests are, first, the failure to cover all phases of grammatical knowledge and, second, the counting of any designation of a part of speech, case, tense or mode as equal to any other. The former shortcoming may be overcome by adding other tests of a similar nature to cover the remaining aspects of grammatical knowledge. A test on sentence analysis or diagramming ought very likely to be added. The second limitation may be remedied by scaling the values of the various designations. In spite of these limitations, which fundamentally are not of a serious character, these tests provide quite accurate measures of grammatical knowledge and are far more accurate than ordinary methods of testing and marking. These limitations are pointed out here because it is important to recognize in a fair way what the defects of any scale or test are, since the ultimate usefulness of any measuring instrument depends upon its degree of accuracy.

CHAPTER VIII

THE MEASUREMENT OF ABILITY IN ARITHMETIC

Arithmetical Scale. Arithmetical ability consists essentially of the capacity to analyze a concrete problem and to carry out correctly the required operations. Hence any complete measurement of ability in arithmetic ought to measure capacity for reasoning and facility in at least the four fundamental operations.

A scale for measuring arithmetical ability has been prepared on the same principles as the grammatical scales. The arithmetical scale is composed of a series of steps of regularly increasing difficulty. The problems for these steps were determined experimentally and located according to their percentages of correctness. A pupil's score is the highest step done correctly. If a pupil passes all steps up to and including the eighth, and fails on all beyond that, his score is eight. If he fails on nine and does ten and fails on the rest his score is nine. That is, he is credited with each additional step passed beyond where he first failed.

Arithmetical Scale A¹

(Prepared by D. Starch.)

The numbers in parenthesis are the actual scale values of the problems.

Do the following problems in the order given. Do all the work on the back of this sheet.

Step 1 (.4)

Mary had 4 apples and her mother gave her 7 more. How many apples did Mary then have? Answer.

Step 4 (3.8)

Sam had 12 marbles. He found 3 more and then gave 6 to George. How many did Sam have left? Answer.

¹ Copies of this test may be obtained from the author in desired quantities.

Step 6 (5.9)

John sold 4 Saturday Evening Posts at 5 cents each. He kept $\frac{1}{2}$ the money and with the other $\frac{1}{2}$ he bought Sunday papers at 2 cents each. How many did he buy? Answer.

Step 7 (6.7)

If you buy 2 tablets at 7 cents each and a book for 65 cents, how much change should you receive from a two-dollar bill? Answer.

Step 8 (7.7)

How many pencils can you buy for 50 cents at the rate of 2 for 5 cents? Answer.

Step 9 (9.2)

A farmer who had already sold 1897 barrels of apples from his orchard hired 59 boys to pick the apples left on his trees. Each boy picked 24 barrels of apples. What was the total number of barrels the farmer got from his orchard that year? Answer.

Step 10 (10.3)

A newsdealer bought some magazines for \$1. He sold them for \$1.20, gaining 5 cents on each magazine. How many magazines were there? Answer.

Step 11 (11.3)

In the schools of a certain city there are 2200 pupils; $\frac{1}{2}$ are in the primary grades, $\frac{1}{4}$ in the grammar grades, $\frac{1}{8}$ in the high school and the rest in the night school. How many pupils are there in the night school? Answer.

Step 12 (11.7)

If 3 and $\frac{1}{2}$ tons of coal cost \$21, what will 5 and $\frac{1}{2}$ tons cost?

Step 13 (12.9)

A school in a certain city used 2516 pieces of chalk in 37 school days. Three new rooms were opened, each room holding 50 children, and the school was then found to use 84 sticks of chalk per day. How many more sticks of chalk were used per day than at first? Answer.

Step 14 (14.2)

A girl spent $\frac{1}{8}$ of her money for car fare, and three times as much for clothes. Half of what she had left was 80 cents. How much money did she have at first? Answer.

Step 15 (15.1)

John had \$1.20 Monday. He earned 30 cents each day on Tuesday, Wednesday, Thursday and Friday. Saturday morning he spent one-third of what he had earned in the four days. Saturday afternoon his father gave John half as much as John then had. How much did his father give John? Answer.

Name.....City.....

Grade.....Date.....

School.....Age.....Years.....Months.....

Standard June Scores. The following are standard scores for the ends of the respective years as derived from 2515 pupils in 18 schools:

Grade	3	4	5	6	7	8
Score	4.5	6.2	7.8	9.4	11.0	12.6

Courtis Tests ¹—Series B. For measuring ability in the four fundamental operations the tests prepared by S. A. Courtis and known as Series B are here recommended for use. The tests are scored by determining the number of problems done correctly. The following are the standard June scores for the various grades, derived from approximately 25,000 pupils.

Grades	3	4	5	6	7	8
Addition Test 1						
Attempts	4.0	6.0	7.5	9.0	10.5	12.0
Rights	2.0	3.0	4.0	5.0	6.5	8.0
Subtraction Test 2						
Attempts	4.0	6.0	8.0	10.0	11.5	12.5
Rights	1.0	3.0	5.5	7.0	8.5	10.0
Multiplication Test 3						
Attempts	4.5	7.0	8.5	10.0	11.5	
Rights	1.5	4.0	5.5	6.5	8.0	
Division Test 4						
Attempts	3.5	5.0	6.5	8.5	10.5	
Rights	1.0	3.0	5.0	7.0	9.0	

¹ Copies of these tests may be obtained from S. A. Courtis, 82 Eliot St., Detroit, Michigan.

Arithmetic. Test No. 1. Addition.

Series B Form 2

You will be given eight minutes to find the answers to as many of these addition examples as possible. Write the answers on this paper directly underneath the examples. You are not expected to be able to do them all. You will be marked for both speed and accuracy, but it is more important to have your answers right than to try a great many examples.

127	996	237	386	186	474
375	320	949	463	775	787
953	778	486	827	684	591
333	886	987	240	260	106
325	913	354	616	372	869
911	164	600	261	846	451
554	897	744	755	595	336
167	972	195	833	254	820
<u>554</u>	<u>119</u>	<u>234</u>	<u>959</u>	<u>137</u>	<u>533</u>

877	537	237	564	632	674
845	685	492	278	263	158
981	452	679	947	318	745
693	904	513	522	949	121
184	511	468	989	746	437
772	988	731	243	653	426
749	559	856	334	428	953
256	127	302	669	456	674
<u>258</u>	<u>323</u>	<u>925</u>	<u>142</u>	<u>532</u>	<u>329</u>

421	258	326	267	873	622
988	885	770	854	168	479
465	600	753	684	332	283
114	874	199	358	419	791
676	726	469	938	934	808
729	142	643	333	493	253
235	355	698	493	529	419
190	947	186	775	156	952
<u>406</u>	<u>351</u>	<u>173</u>	<u>239</u>	<u>224</u>	<u>522</u>

485	172	236	537	648	584
871	426	578	227	396	157
524	951	877	725	389	617
919	537	916	598	374	624
722	989	543	906	859	467
456	565	593	763	191	369
216	230	956	195	423	511
862	673	439	480	849	245
<u>424</u>	<u>258</u>	<u>309</u>	<u>102</u>	<u>342</u>	<u>233</u>

Arithmetic. Test No. 2. Subtraction

Series B Form 2

You will be given four minutes to find the answers to as many of these subtraction examples as possible. Write the answers on this paper directly underneath the examples. You are not expected to be able to do them all. You will be marked for both speed and accuracy, but it is more important to have your answers right than to try a great many examples.

114957187	94752808	106089449
90271797	67349640	16915390

99833978	115171700	82484740
<u>73160227</u>	<u>63087381</u>	<u>48207825</u>

115916913	72229470	146246252
<u>55536329</u>	<u>45049173</u>	<u>52160891</u>

80630266	124485018	107419373
<u>68164329</u>	<u>73098624</u>	<u>65348405</u>

37953635	137825921	152695030
<u>23913884</u>	<u>62729490</u>	<u>85612816</u>

178976226	97089301	93994413
93060303	20203267	54783938

108051861
73463849

163130569
91061255

168354186
70537861

188545364
92471259

120981427
64188045

105755782
90863147

Arithmetic. Test No. 3. Multiplication

Series B Form 2

You will be given six minutes to work as many of these multiplication examples as possible. You are not expected to be able to do them all. Do your work directly on this paper; use no other. You will be marked for both speed and accuracy, but it is more important to have your answers right than to try a great many examples.

8259
28

3467
93

4637
82

2859
47

7436
65

5289
39

6473
740

8529
56

8632
206

5947
62

3268
95

4795
83

7954
74

2386
38

9745
59

6283
47

9624
503

7853
35

4926
620

5873
49

2964
94

8357
87

6249
78

3875
35

Arithmetic. Test No. 4. Division

Series B Form 2

You will be given eight minutes to work as many of these division examples as possible. You are not expected to be able to

do them all. Do your work directly on this paper; use no other. You will be marked for both speed and accuracy, but it is more important to have your answers right than to try a great many examples.

$$24 \overline{)6984} \quad 95 \overline{)85880} \quad 36 \overline{)10440} \quad 87 \overline{)81867}$$

$$78 \overline{)62868} \quad 42 \overline{)17682} \quad 63 \overline{)26460} \quad 59 \overline{)50799}$$

$$36 \overline{)16236} \quad 87 \overline{)61161} \quad 95 \overline{)69350} \quad 24 \overline{)10800}$$

$$63 \overline{)42903} \quad 42 \overline{)28560} \quad 59 \overline{)29913} \quad 78 \overline{)44538}$$

$$29 \overline{)24679} \quad 57 \overline{)51642} \quad 38 \overline{)32300} \quad 64 \overline{)61504}$$

$$46 \overline{)34086} \quad 75 \overline{)55500} \quad 92 \overline{)27784} \quad 83 \overline{)26643}$$

Courtis Tests — Series A. Before Series B had been prepared, Courtis prepared a set of arithmetical tests known as Series A which have been used very extensively and are designed to measure performance in eight functions: addition, subtraction, multiplication, division, copying, speed of reasoning, fundamentals, and reasoning. The standard June scores, based on over 60,000 pupils, are as follows:

TEST No.	1	2	3	4	5	6		7		8	
						Ats.	Rts.	Ats.	Rts.	Ats.	Rts.
Grade 3	26	19	16	16	63	2.5	1.5	5.0	1.7	2.5	.5
Grade 4	34	25	23	23	75	3.5	1.8	7.0	3.5	2.9	.7
Grade 5	42	31	30	30	84	4.2	2.6	9.0	5.2	3.1	1.0
Grade 6	50	38	37	37	92	4.9	3.5	11.0	6.7	3.4	1.4
Grade 7	58	44	41	44	100	5.6	4.5	12.5	8.2	3.7	1.9
Grade 8	63	49	45	49	108	6.4	5.7	14.0	9.4	4.0	2.5

The chief criticism to be brought against this set of tests are: (1) The fact that only single number combinations are used in testing the fundamental operations, which does not take into account the process of carrying and of adding longer columns. This may be an advantage for testing the lower grades. (2) The reasoning tests lay

too great emphasis upon speed and are complicated with the factor of speed in reading and grasping the problems. (3) The use of the same test material for all grades will not measure adequately the ability of the lower and upper grades. It is very likely too difficult for the younger pupils and too easy for the older pupils. The tests, however, have proven very useful.

ARITHMETIC — Test No. 1. Speed Test — Addition

Name.....School.....Grade.....

Write on this paper, in the space between the lines, the answers to as many of these addition examples as possible in the time allowed. (One minute is allowed.)

$$\begin{array}{r} 1\ 7\ 9\ 3\ 2 \\ 3\ 7\ 6\ 0\ 4 \\ \hline \end{array}$$

$$\begin{array}{r} 8\ 9\ 7\ 8\ 2 \\ 1\ 9\ 6\ 0\ 5 \\ \hline \end{array}$$

$$\begin{array}{r} 1\ 6\ 9\ 0\ 4 \\ 2\ 6\ 5\ 1\ 2 \\ \hline \end{array}$$

$$\begin{array}{r} 1\ 3\ 6\ 0\ 3 \\ 5\ 8\ 9\ 7\ 2 \\ \hline \end{array}$$

$$\begin{array}{r} 3\ 4\ 7\ 0\ 3 \\ 1\ 6\ 9\ 8\ 5 \\ \hline \end{array}$$

$$\begin{array}{r} 5\ 8\ 6\ 9\ 4 \\ 1\ 3\ 5\ 0\ 3 \\ \hline \end{array}$$

$$\begin{array}{r} 1\ 4\ 8\ 0\ 2 \\ 6\ 7\ 9\ 5\ 7 \\ \hline \end{array}$$

$$\begin{array}{r} 1\ 2\ 5\ 6\ 7 \\ 4\ 9\ 8\ 0\ 2 \\ \hline \end{array}$$

$$\begin{array}{r} 1\ 3\ 8\ 2\ 3 \\ 7\ 9\ 5\ 0\ 7 \\ \hline \end{array}$$

$$\begin{array}{r} 1\ 8\ 6\ 0\ 5 \\ 9\ 4\ 7\ 2\ 4 \\ \hline \end{array}$$

$$\begin{array}{r} 2\ 9\ 7\ 4\ 5 \\ 2\ 3\ 8\ 0\ 2 \\ \hline \end{array}$$

$$\begin{array}{r} 4\ 8\ 9\ 5\ 3 \\ 1\ 8\ 7\ 0\ 6 \\ \hline \end{array}$$

$$\begin{array}{r} 9\ 2\ 5\ 0\ 6 \\ 1\ 8\ 7\ 4\ 3 \\ \hline \end{array}$$

$$\begin{array}{r} 3\ 7\ 9\ 0\ 4 \\ 3\ 4\ 8\ 6\ 5 \\ \hline \end{array}$$

$$\begin{array}{r} 7\ 4\ 8\ 0\ 3 \\ 1\ 9\ 6\ 0\ 4 \\ \hline \end{array}$$

$$\begin{array}{r} 2\ 4\ 5\ 1\ 6 \\ 1\ 8\ 9\ 0\ 2 \\ \hline \end{array}$$

$$\begin{array}{r} 5\ 9\ 6\ 7\ 5 \\ 5\ 2\ 8\ 0\ 3 \\ \hline \end{array}$$

$$\begin{array}{r} 6\ 9\ 8\ 1\ 2 \\ 1\ 4\ 7\ 1\ 3 \\ \hline \end{array}$$

$$\begin{array}{r} 4\ 8\ 5\ 0\ 7 \\ 4\ 2\ 6\ 9\ 3 \\ \hline \end{array}$$

$$\begin{array}{r} 1\ 6\ 7\ 0\ 2 \\ 8\ 4\ 5\ 3\ 6 \\ \hline \end{array}$$

$$\begin{array}{r} 8\ 9\ 7\ 8\ 5 \\ 1\ 9\ 6\ 0\ 2 \\ \hline \end{array}$$

$$\begin{array}{r} 1\ 4\ 9\ 0\ 4 \\ 6\ 7\ 5\ 1\ 2 \\ \hline \end{array}$$

$$\begin{array}{r} 1\ 7\ 9\ 3\ 2 \\ 3\ 7\ 6\ 0\ 4 \\ \hline \end{array}$$

$$\begin{array}{r} 1\ 2\ 6\ 0\ 3 \\ 6\ 7\ 9\ 7\ 2 \\ \hline \end{array}$$

ARITHMETIC—Test No. 2. Speed Test—Subtraction

Name _____ School _____ Grade _____

Write on this paper, in the space between the lines, the answers to as many of these subtraction examples as possible in the time allowed. (One minute is allowed.)

$$\begin{array}{r} 8 \ 11 \ 12 \ 5 \ 10 \\ 0 \ 9 \ 7 \ 1 \ 2 \\ \hline \end{array}$$

$$\begin{array}{r} 9 \ 7 \ 11 \ 8 \ 12 \\ 9 \ 3 \ 6 \ 1 \ 3 \end{array}$$

$$\begin{array}{r} 6 \ 11 \ 15 \ 10 \ 12 \\ 0 \ 7 \ 8 \ 9 \ 4 \end{array}$$

$$\begin{array}{r} 1 \ 9 \ 13 \ 4 \ 12 \\ 0 \ 7 \ 8 \ 3 \ 6 \\ \hline \end{array}$$

$$\begin{array}{r} 4 \ 10 \ 13 \ 10 \ 9 \\ 4 \ 7 \ 5 \ 1 \ 4 \end{array}$$

$$\begin{array}{r} 2 \ 7 \ 13 \ 3 \ 10 \\ 1 \ 5 \ 7 \ 2 \ 5 \end{array}$$

$$\begin{array}{r} 5 \ 8 \ 17 \ 6 \ 11 \\ 5 \ 6 \ 9 \ 4 \ 8 \\ \hline \end{array}$$

$$\begin{array}{r} 1 \ 6 \ 15 \ 4 \ 8 \\ 1 \ 3 \ 9 \ 2 \ 3 \end{array}$$

$$\begin{array}{r} 7 \ 8 \ 16 \ 9 \ 11 \\ 0 \ 5 \ 7 \ 1 \ 4 \end{array}$$

$$\begin{array}{r} 4 \ 9 \ 6 \ 7 \ 11 \\ 0 \ 6 \ 9 \ 1 \ 3 \\ \hline \end{array}$$

$$\begin{array}{r} 9 \ 7 \ 14 \ 5 \ 11 \\ 0 \ 2 \ 8 \ 4 \ 2 \end{array}$$

$$\begin{array}{r} 5 \ 12 \ 15 \ 5 \ 16 \\ 0 \ 9 \ 6 \ 3 \ 8 \end{array}$$

$$\begin{array}{r} 2 \ 10 \ 11 \ 9 \ 4 \\ 0 \ 6 \ 5 \ 8 \ 7 \\ \hline \end{array}$$

$$\begin{array}{r} 2 \ 12 \ 15 \ 3 \ 10 \\ 2 \ 8 \ 7 \ 1 \ 3 \end{array}$$

$$\begin{array}{r} 6 \ 7 \ 17 \ 6 \ 9 \\ 6 \ 4 \ 8 \ 1 \ 2 \end{array}$$

$$\begin{array}{r} 8 \ 13 \ 12 \ 8 \ 13 \\ 8 \ 9 \ 5 \ 7 \ 4 \\ \hline \end{array}$$

$$\begin{array}{r} 7 \ 6 \ 13 \ 10 \ 9 \\ 7 \ 2 \ 6 \ 8 \ 3 \end{array}$$

$$\begin{array}{r} 0 \ 5 \ 14 \ 7 \ 8 \\ 0 \ 2 \ 5 \ 6 \ 2 \end{array}$$

$$\begin{array}{r} 3 \ 8 \ 14 \ 6 \ 10 \\ 0 \ 4 \ 9 \ 5 \ 4 \\ \hline \end{array}$$

$$\begin{array}{r} 3 \ 9 \ 14 \ 4 \ 18 \\ 3 \ 5 \ 6 \ 1 \ 9 \end{array}$$

$$\begin{array}{r} 6 \ 11 \ 15 \ 10 \ 12 \\ 0 \ 7 \ 8 \ 9 \ 4 \end{array}$$

$$\begin{array}{r} 8 \ 11 \ 12 \ 5 \ 10 \\ 0 \ 9 \ 7 \ 1 \ 2 \\ \hline \end{array}$$

$$\begin{array}{r} 1 \ 9 \ 13 \ 4 \ 12 \\ 0 \ 7 \ 8 \ 3 \ 6 \end{array}$$

$$\begin{array}{r} 9 \ 7 \ 11 \ 8 \ 12 \\ 9 \ 3 \ 6 \ 1 \ 3 \end{array}$$

ARITHMETIC—Test No. 3. Speed Test— Multiplication

Name.....School.....Grade.....

Write on this paper, in the space between the lines, the answers to as many of these multiplication examples as possible in the time allowed. (One minute is allowed.)

$$\begin{array}{r} 42749 \\ 19605 \end{array}$$

$$\begin{array}{r} 23907 \\ 13654 \end{array}$$

$$\begin{array}{r} 34905 \\ 27826 \end{array}$$

$$\begin{array}{r} 95476 \\ 12805 \end{array}$$

$$\begin{array}{r} 12708 \\ 68763 \end{array}$$

$$\begin{array}{r} 82754 \\ 16906 \end{array}$$

$$\begin{array}{r} 12815 \\ 95713 \end{array}$$

$$\begin{array}{r} 25607 \\ 35983 \end{array}$$

$$\begin{array}{r} 13765 \\ 25809 \end{array}$$

$$\begin{array}{r} 62895 \\ 17407 \end{array}$$

$$\begin{array}{r} 32608 \\ 14715 \end{array}$$

$$\begin{array}{r} 43986 \\ 26704 \end{array}$$

$$\begin{array}{r} 14804 \\ 54935 \end{array}$$

$$\begin{array}{r} 13603 \\ 74809 \end{array}$$

$$\begin{array}{r} 73924 \\ 18903 \end{array}$$

$$\begin{array}{r} 16809 \\ 42873 \end{array}$$

$$\begin{array}{r} 25437 \\ 28905 \end{array}$$

$$\begin{array}{r} 58605 \\ 12394 \end{array}$$

$$\begin{array}{r} 16917 \\ 82402 \end{array}$$

$$\begin{array}{r} 19803 \\ 32647 \end{array}$$

$$\begin{array}{r} 34905 \\ 27826 \end{array}$$

$$\begin{array}{r} 95476 \\ 12805 \end{array}$$

$$\begin{array}{r} 42749 \\ 19605 \end{array}$$

$$\begin{array}{r} 23907 \\ 13654 \end{array}$$

ARITHMETIC — Test No. 4. Speed Test — Division

Name _____ School _____ Grade _____

Write on this paper, in the space between the lines, the answers to as many of these division examples as possible in time allowed. (One minute is allowed.)

$9 \overline{)9}$ $3 \overline{)21}$ $6 \overline{)48}$ $1 \overline{)1}$ $5 \overline{)10}$ $3 \overline{)9}$ $4 \overline{)32}$ $6 \overline{)36}$ $2 \overline{)0}$ $7 \overline{)28}$

$1 \overline{)8}$ $5 \overline{)30}$ $8 \overline{)72}$ $1 \overline{)0}$ $9 \overline{)36}$ $2 \overline{)6}$ $4 \overline{)24}$ $7 \overline{)63}$ $6 \overline{)0}$ $8 \overline{)32}$

$1 \overline{)4}$ $5 \overline{)35}$ $9 \overline{)45}$ $2 \overline{)2}$ $3 \overline{)12}$ $8 \overline{)8}$ $4 \overline{)28}$ $5 \overline{)40}$ $2 \overline{)2}$ $8 \overline{)16}$

$5 \overline{)5}$ $4 \overline{)36}$ $9 \overline{)54}$ $8 \overline{)0}$ $4 \overline{)12}$ $1 \overline{)5}$ $2 \overline{)16}$ $8 \overline{)48}$ $1 \overline{)2}$ $9 \overline{)27}$

$3 \overline{)6}$ $4 \overline{)20}$ $7 \overline{)49}$ $1 \overline{)3}$ $2 \overline{)8}$ $1 \overline{)7}$ $2 \overline{)10}$ $7 \overline{)42}$ $1 \overline{)1}$ $6 \overline{)18}$

$5 \overline{)0}$ $3 \overline{)24}$ $9 \overline{)63}$ $2 \overline{)4}$ $8 \overline{)24}$ $6 \overline{)6}$ $3 \overline{)27}$ $8 \overline{)64}$ $1 \overline{)2}$ $4 \overline{)16}$

$7 \overline{)7}$ $2 \overline{)18}$ $6 \overline{)42}$ $3 \overline{)0}$ $7 \overline{)21}$ $5 \overline{)5}$ $2 \overline{)14}$ $8 \overline{)40}$ $9 \overline{)0}$ $5 \overline{)15}$

$4 \overline{)4}$ $3 \overline{)15}$ $9 \overline{)81}$ $7 \overline{)0}$ $6 \overline{)12}$ $4 \overline{)4}$ $6 \overline{)30}$ $8 \overline{)56}$ $1 \overline{)0}$ $7 \overline{)14}$

$1 \overline{)5}$ $3 \overline{)18}$ $9 \overline{)72}$ $4 \overline{)0}$ $6 \overline{)24}$ $1 \overline{)4}$ $2 \overline{)12}$ $5 \overline{)45}$ $3 \overline{)3}$ $4 \overline{)8}$

$1 \overline{)6}$ $7 \overline{)35}$ $6 \overline{)54}$ $1 \overline{)3}$ $5 \overline{)20}$ $1 \overline{)9}$ $5 \overline{)25}$ $7 \overline{)56}$ $3 \overline{)3}$ $9 \overline{)18}$

$1 \overline{)8}$ $5 \overline{)30}$ $8 \overline{)72}$ $1 \overline{)6}$ $9 \overline{)36}$ $9 \overline{)9}$ $3 \overline{)21}$ $6 \overline{)48}$ $1 \overline{)1}$ $5 \overline{)10}$

$3 \overline{)9}$ $4 \overline{)32}$ $6 \overline{)36}$ $2 \overline{)0}$ $7 \overline{)28}$ $2 \overline{)5}$ $4 \overline{)24}$ $7 \overline{)35}$ $6 \overline{)0}$ $8 \overline{)32}$

ARITHMETIC — Test No. 5. Speed Test —
Copying Figures

Name ----- *School* ----- *Grade* -----

Copy on this paper, in the space between the lines, as many of the printed figures as possible in the time allowed. Write as rapidly as possible, but form the figures as carefully as in working examples. (One minute is allowed.)

2 4 9 6 7 4 2 9 7 6 6 2 9 4 7 7 2 9 6 4 2 4 9 7 6

4 2 9 6 7 6 2 9 7 4 7 2 9 4 6 2 6 9 7 4 4 6 9 2 7

6 4 9 7 2 7 4 9 2 6 2 6 9 4 7 4 6 9 7 2 6 4 9 2 7

7 4 9 6 2 2 7 9 4 6 4 7 9 6 2 6 7 9 2 4 7 6 9 4 2

2 7 9 6 4 4 7 9 2 6 6 7 9 4 2 7 6 9 2 4 2 4 9 6 7

4 2 9 7 6 6 2 9 4 7 7 2 9 6 4 2 4 9 7 6 4 2 9 6 7

6 2 9 7 4 7 2 9 4 6 2 6 9 7 4 4 6 9 2 7 6 4 9 7 2

7 4 9 2 6 2 6 9 4 7 4 6 9 7 2 6 4 9 2 7 7 4 9 6 2

2 4 9 6 7 4 2 9 7 6 6 2 9 4 7 7 2 9 6 4 2 4 9 7 6

4 2 9 6 7 6 2 9 7 4 7 2 9 4 6

ARITHMETIC — Test No. 6

Speed Test — Reasoning

Name.....School.....Grade.....

Do not work the following examples. Read each example through, make up your mind what operation you would use if you were going to work it, then write the name of the operation selected in the blank space after the example. Use the following abbreviations: — “Add.” for addition, “Sub.” for subtraction, “Mul.” for multiplication, and “Div.” for division. (One minute is allowed.)

1. A boy played several games of marbles. He had 15 marbles when he began to play and he won 13. How many marbles did he have when the games were over?

2. One day in vacation a boy went on a four-day fishing trip. He caught just 12 fish on each of the four days. How many fish did he catch on the trip?

3. In a certain class, the heaviest child weighed 126 pounds. If he was three times as heavy as the lightest child, how much did the lightest child weigh?

4. Two sisters practiced lifting weights. One girl could lift 90 pounds, the other girl but 53 pounds. How many pounds more could one girl lift than the other?

5. A girl watching from a window saw 27 automobiles pass a school in an hour. Each auto carried 4 lamps. How many lamps did she see in the hour?

Operation	

ARITHMETIC — Test No. 6 — *Continued*

Speed Test — Reasoning

Name.....School.....Grade.....

12. A girl, making a collection of postal cards, bought 7 packages in one day. Each package contained 12 cards. How many cards did she buy that day?

13. A girl found that it took her 27 minutes to walk from her home to her school which was 18 blocks away. How long did it take her to walk a block?

14. A club of boys sent their treasurer to buy a baseball. They gave him 75c and he spent 45c. How much money did he have to take back to the club?

15. In a school the 7 sections of the eighth grade were each 13 children smaller in June than in September. How many children left the grade during the year?

16. A boy walked 9 blocks from his house towards a school to meet his chum. They walked the remaining 7 blocks together. How far did the boy live from the school?

Operation	

*'Measure the efficiency of the entire school,
not the individual ability of the few'*

SCORE

No. attempted ---

No. right-----

ARITHMETIC — Test No. 7. Fundamentals

Name ----- School ----- Grade -----

In the blank space below, work as many of these examples as possible in the time allowed. Work them in order as numbered, writing each answer in the "answer" column before commencing a new example. Do no work on any other paper. (Twelve minutes are allowed.)

No.	Operation	Example	Answer	Right
1	Addition	a $32 + 130 + 725 =$ (Write answer in this column) 757 b $152 + 8001 + 120 + 3023 =$		
2	Subtraction	a $4748 - 136 =$ b $362974 - 221801 =$		
3	Multiplication	$2201 \times 231 =$		
4	Division	$375024 \div 312 =$		
5	Addition	$8225 + 134 + 2900 + 5004$ $+ 4050 + 363 =$		
6	Subtraction	$62132104 - 38396767 =$		
7	Multiplication	$56804 \times 564 =$		
8				
9	Division	$15826992 \div 4 =$		
10	Division	$3333220 \div 436 =$		
11				
12	Addition	$78558 + 68696 + 59393 +$ $73859 + 66773 + 86696$ $+ 68887 + 98951 =$		
13		$16535424 - 8875657 =$		
14	Subtraction	$89576 \times 876 =$		
15	Multiplication	$51495423 \div 7 =$		
16				
17	Division	$5361384 \div 679 =$		
18	Division			
19				

ARITHMETIC — Test No. 8

Reasoning

Name.....School.....Grade.....

In the blank space below, work as many of the following examples as possible in the time allowed. Work them in order as numbered, entering each answer in the "answer" column before commencing a new example. Do no work on any other paper. (Six minutes are allowed.)

1. A farmer who had already sold 1897 barrels of apples from his orchard hired 59 boys to pick the apples left on his trees. Each boy picked 24 barrels of apples. What was the total number of barrels the farmer got from his orchard that year?

2. At a candy pull, 49 children, 27 girls and 22 boys, made 3 kinds of candy in 90 minutes. The total number of pieces made was 2765, of which 560 were eaten at the party. The rest were shared equally. How many pieces did each one get? . . .

3. On a bicycle trip a party of boys rode 15 miles the first hour, 17 miles the second, 11 miles the third, and 14 miles the fourth, then stopped for the day. If they rode as many miles on each of the 27 days, what was the total length of the trip?

4. A group of 12 children took turns in counting the automobiles that passed a school. They counted 1833 autos in 39 hours. Six months later they counted 58 autos an hour. How many more machines passed the school each hour than at first? . . .

Answer	

ARITHMETIC — Test No. 8 — *Continued*

Reasoning

Name.....School.....Grade.....

5. A party of 5 children traveled 12 miles from a school to a woods to gather nuts. One child found 20 nuts, a second, 25 nuts, a third, 83 nuts, a fourth, 140 nuts, and the last 160 nuts. They wanted 600 nuts altogether. How many more did they need ?

6. During the year a room in a school used 9 boxes of chalk, each holding 144 sticks. There were 48 children in the room. If each child had been given his share at the beginning of the year, how many sticks would each have received ?

7. At 2 Christmas entertainments for poor children 2400 presents were given away the first night, and 3000 presents the second night. If 216 rooms in the 22 schools of the city each contributed its share of the presents, how many did one room give ?

8. A girl read 105 pages in both her reader and her history. By counting she found there were 2342 letters on one page of her history and 2295 letters on a page of her reader. How many more letters had she read in one book than in the other ?

Total

Answer	

CHAPTER IX

THE MEASUREMENT OF ABILITY IN ENGLISH COMPOSITION

Two scales have been prepared for the measurement of merit or quality of English compositions: the Hillegas-Thorndike scale and the Harvard-Newton scale. The Hillegas-Thorndike scale was prepared on the same general principles as the Thorndike handwriting scale. A large number of compositions by young people were rated in the order of merit as estimated by competent persons. The scale as it stands is composed of a series of steps ranging in quality from 0 to 95 with one or more samples for each quality. A composition is rated according to the scale by determining to what step on the scale it is most nearly equal.

Directions for Administering and Scoring the Test. The pupils are to write with pen and ink on regular, ruled paper. They should put at the top of the sheet the name, grade, school, city and date.

Subject for composition: "The Season of the Year that I like Best and Why." (Some other suitable subject may be used if it seems desirable.)

Time: Allow a minute or two for questions and for writing the name, etc., at the top of the page.

Then allow the pupils fifteen minutes to write the composition. No suggestions or help should be given.

The compositions are then scored by the Hillegas-Thorndike scale or, if preferred, by the Harvard-Newton scale.

The results of a class should be tabulated to show the name of each pupil together with his score, and the average score for the entire class.

PRELIMINARY EXTENSION OF THE
HILLEGAS SCALE FOR THE MEASUREMENT OF
QUALITY IN ENGLISH COMPOSITION
BY YOUNG PEOPLE

BY EDWARD L. THORNDIKE

TEACHERS COLLEGE, COLUMBIA UNIVERSITY

QUALITY 0

Letter.

Dear Sir: I write to say that it aint a square deal Schools is I say they is I went to a school. red and gree green and brown aint it hito bit I say he don't know his business not to-day nor yewaterday and you know it and I want Jennie to get me out.

QUALITY 18

My Favorite Book.

the book I refer to read is Ichabod Crane, it is an grate book and I like to rede it. Ichabod Crame was a man and a man wrote a book and it is called Ichabod Crane i like it because the man called it ichabod crane when I read it for it is such a great book.

QUALITY 30

How tobacco is that it is to expensive to ship the tobacco over to the northern states and by frieght it is cheaper because they do not have to cross the water and they do not send it so quick. The men that send the bales of tobacco get more than all of the tobacco is worth. And because they charge to dear is they take to much pains with it and sell it dear. And some times the noursisment gets to dry that they buy more of the land for the tobacco and that they can raise more of it. The people have tobacco fields are very glad to have railways cut through thier fields because they do not have to go far to them. Because this change has been made is just what I have been telling you and that is why between the northern and the Southern States.

QUALITY 37

Sulla as a Tyrant.

When Sulla came back from his conquest Marius had put himself consul, so Sulla with the army he had with him in his conquest siezed the government from Marius and put himself in consul and had a list of his enemys printy and the men whoes names were on this list we beheaded.

QUALITY 40

This man who is the chief character of this story, is the stingiest man in town one day before Christmas and the nicest man on Christmas, and this all comes from a dream. His name is Soloman and in his dream he dreams of coming home to his old cheap looking home, in an old side alley and, as he gets to the door this gosts head appears and as he opens the door it departs, lighting a match to go up stairs with, not fearing the gost, and then starts up stairs and he had no sooner reached the top step when there was and auful clammer of chains and bells, As he walks into his room he hears the sound coming up the stairs nearer and nearer to his room every minute, And after he got in bed and blew out the light, he heard the gost walk right in his room and call him so he got up, being scared and afraid the gost would harm him, the gost told him to sit down beside him which he did, And then he said that he was Soloman partner and had died twenty years ago.

QUALITY 47

De Quincy.

First: De Quincys mother was a beautiful women and through her De Quincy inhereted much of his genius.

His running away from school enfluenced him much as he roamed through the woods, valleys and his mind became very meditative.

The greatest enfluence of De Quincy's life was the opium habit. If it was not for this habit it is doubtful whether we would now be reading his writings.

His companions during his college course and even before that time were great enfluences. The surroundings of De Quincy were enfluences. Not only De Quincy's habit of opium but other habits which were peculiar to his life.

His marriage to the woman which he did not especially care for.
The many well educated and noteworthy friends of De Quincy.

QUALITY 50

At the time of a Revolution and general tumult the people needed something to turn their attentions and Paine's arrival seemed to be the very help for it. In England he had been known to express his opinions openly and now in America he did the same thing. He made a success of his magazine "Common Sense" from the very out-start for it was inside exactly what the name implied. He raised good sane arguments that others before him had only felt but dared not to write of them. It was soon the most popular thing read, not only here but also abroad in many of the colonies. The authorship for a time was thought to be Samuel or John Adams or Dr. Franklin, but it soon became known that Paine was the author. This created violent hate amongst the Tories and they were always writing against different articles that appeared in the "Common Sense. Nevertheless the reputation of the magazine was rather increased than lessened by these protestations of the Tories Paine died a penniless patriot although he had gained a great name for himself.

A University out west, I cannot remember the name, is noted for its hazing, and this is what the story is about. It is the hazing of a freshman. There was a freshman there who had been acting as if he didn't respect his upper class men so they decided to teach him a lesson. The student brought before the Black Avenger's which is a society in all college to keep the freshman under their rules so they decided to take him to the rail-road track and tie him to the rails about two hours before a train was suspected and leave him there for about an hour, which was a hour before the 9.20 train was expected. The date came that they planned this hazing for so the captured the fellow blindfolded him and lead him to the rail road tracks, where they tied him.

QUALITY 60

Common Sense.

A pamphlet written by Payne shortly after the Pennsylvania Rebellion. Dr. Franklin introduced the author as a young man

when he came to Philadelphia but he had left behind him in England a ruined career. This may be due to the times in which he lived. There was no demand for the ideas of a humble man and had he tried to create a demand it is likely he would have heard a good deal from the king's officers.

Although Franklin asked that he be put in the way of obtaining a clerkship, he turned his attention to literature, and his articles were the making of a magazine just started in Philadelphia. He had the courage of his convictions. The pamphlet dealt with the conditions of the times. The absurdity of being dependent on a country so far away. There was a time when it was right and proper. That time was now past. The book made a great impression on the Colonists and also on the people abroad. Payne realized that if men were to fight they must understand the reason.

The authorship was questioned several prominent names being associated with its authorship

Payne received no compensation except celebrity.

Deephagen.

Deephagen, one of the small New England towns was situated on the coast. The town was barren and the wind swept over the place all winter long. Scarcely a person could be seen anywhere's around out of doors. The leaves had fallen all over the place and the town gave us a picture of an old, desolate, forlorn place. The homes of the people were scattered here and there and one could tell that the occupation of the people were either farmers or fishermen by the looks of the old, shut-up houses.

In summer, the town although not American was more full of life. You could see the flower beds in the front yards blooming and there was also a hustle and bustle of fishermen around the town. The houses were open and the trees all around the place were in full bloom. The town did not impress one in summer as being so terribly lonesome.

Composition.

If I should be given a thousand dollars with which to do as I pleased I would first supply myself with presents for my friends.

I should buy regardless of price and remember every one the best I new how.

Next I would donate a part of this sum to the charity organization, and I should then have a large enough amount left to make a visit during the holidays. The visit which I would like to take would be down through the southern part of Indiana, then out to the large farm house of my aunts, where I would eat of a large turkey and all the other good things that go with it.

I would make use of my money in this way so that I myself would be pleased and at the same time I would be pleasing my friend. And with the amount which I gave to the charity organization would please some who had no friends and others who could not afford to buy any thing to make them happy.

434 West Twenty Second Street.
September 22nd. 1908.

The Produce National Bank,
#60 Wall St.,
New York City, N. Y.

Gentlemen: —

In reply to your advertisement in the New York Times for a "bank runner," I would say that I gladly tender my services, and believe myself well fitted to accept the position as I have and thorough knowledge of the business section of the city and having had eight months experience in the capacity which you name.

Respectfully Yours,
William H Herbert.

QUALITY 70

"Common Sense."

Thomas Paine came to America in 1774, at the close of the Pennsylvania Revolution. He had been ejected from his position in England because he gave his political opinions too positively there. He came to America with a letter from Dr. Franklin, asking his friends to find the young man a position as clerk, teacher, or something of that kind. But Paine decided to turn his attention to literature. His articles were the making of the Pennsylvania Magazine, and he

soon became editor of it. He conducted the magazine very successfully, writing articles on many subjects, especially those of novel and often unpopular principles. He wrote on matters of church, divorce, duelling, the ill-treatment of animals, international arbitration and many other subjects.

In January, 1776, a pamphlet appeared which occasioned a great stir. It was called "Common Sense" and contained all the merits the title indicated. I

Deephaven.

Deephaven was not a thriving overcrowded town possessed with the American spirit. It did not have "hurry" or the dollar bill sign as its watch-word, as does New York City. On the contrary it was a lonely receding unprogressive town in New England. Its men were not ambitious men of the Napoleonic type nor were they Miltons nor Cromwells. Most of the male population claimed the occupation of fishing, as a means of livelihood. The town was situated on the coast. At great intervals a schooner might dock at Deephaven to load with hay or fire wood.

In the winter time dreary Deephaven was the dreariest of dreary, dismal towns. The leafless trees sighed and moaned as the wind whistled past them. The deserted warves did not present a cheerful appearance for all was still as death. Rheumatism claimed many victims. Once cheery sea-captains now were "blue and gloomy."

Criticism.

"The Thing that Couldn't" by Margaret Cameron, in the December Harpers is a clever little love story telling how a letter was sent, by mistake, to a man who it was absolutely necessary should not see it and regained by a trick. The story is exciting and holds the readers interest from the beginning because of the clear witty way in which it is told. The narrative is never so long that interest flags, nor so brief that important points are omitted and in this way unity is retained. Conversation is mingled with the narration in a way that serves to make the story more interesting and only in one or two places where definite details are needed is any description used.

Fourteenth Century Costumes.

The costumes of the fourteenth century were very peculiar. Rich men and high officials were clothed in the most expensive silks and satins, often wearing wide trousers, which were composed of various colors. A bright colored cloke, often of the same material as the trousers, was thrown over the shoulders. The women of this class dressed as extravagantly as the men. Dresses of bright colors, with long sweeping trains, were the custom. The headdress of this time was very peculiar, in that it was very high. Sometimes reaching the high of two feet.

The dress of the middle class was very much modified, although the colors were bright still the material was not as expensive. The men wore uniforms, signifying to which gild they belonged or what was their trade.

Cheep, course, cloth was used for clothing by the lower class. They were dressed as simply as possible because they could not afford better clothes.

The dress of the church men differed according to the station of the man. The richer churchmen wore more expensive clothing even than the nobles, while the condition of the lower clergy would not allow expensive clothes.

I am going to Princeton partly because it was my father's college. I also prefer to go to a college away from home. You get the college life much more that way. My main reason is on account of the great advantages held forth in the preceptorial system. The preceptorial system is organized as follows. Imagine a class, junior for example of perhaps three hundred, divided into sections of twenty five each. For each of these sections there are six preceptors, men engaged to head groups of four or five to talk over their work with them and give them points and suggestions about it. The advantage of this is that the man gets a great deal more individual attention in this manner than he otherwise would. Princeton has high standards of intellectuality as well as athletics.

QUALITY 77

Going Down with Victory.

As we road down Lombard Street, we saw flags waving from nearly every window. I surely felt proud that day to be the driver of the gaily decorated coach. Again and again we were cheered as we drove slowly to the postmasters, to await the coming of his majestie's mail. There wasn't one of the gaily bedecked coaches that could have compared with ours, in my estimation. So with waving flags and fluttering hearts we waited for the coming of the mail and the expected tidings of victory.

When at last it did arrive the postmaster began to quickly sort the bundles, we waited anxiously. Immediately upon receiving our bundles, I lashed the horses and they responded with a jump. Out into the country we drove at reckless speed — everywhere spreading like wildfire the news, "Victory!" The exileration that we all felt was shared with the horses. Up and down grade and over bridges, we drove at breakneck speed and spreading the news at every hamlet with that one cry "Victory!" When at last we were back home again, it was with the hope that we should have another ride some day with "Victory."

QUALITY 80

"Common Sense."

This pamphlet was a pointed argument against absolute monarchy and tyrannical government. It was an enthusiastic and rhetorical expression of the thoughts, emotions, and ideas of the majority of the American people. Its very nature appealed to them and a copy of it could be found in almost every American home. So very popular did it become that even the people of Europe became interested in it and caused it to be translated into many European languages. This is more remarkable when we consider that European interest in American affairs was a thing which seldom occurred during colonial times. Paine like many other famous men received no material reward, but his memory is held dear in the hearts of present-day American citizens.

Deephaven.

Deephaven was a little town on the coast of New England, but one would hardly believe it was American. It seemed more like a little old English village, quiet, dull, and sleepy. There were no manufacturies, so the few inhabitants spent their time on their little fishing sloops. The houses were old weather-beaten cottages; no one knew when the last one had been built. Once or twice a year a boat came to load lumber there; but Deephaven had once been a prosperous town, as the deserted warehouses on the wharves showed.

In winter Deephaven was even more desolate than in summer. The ground was bare and rocky, the trees leafless, except for the oaks which are the most mournful growing things when their dry leaves rustle and whisper in the wind. The houses were all closed as tightly as possible and there were few people who dared venture outside their doors. Once in a while one would see some old sea captain, who was braver than the others, roll along the street, bracing himself against the powerful wind. You could always tell him by his big reefer with the enormous bone buttons and big flaps over the pockets.

All the flowers in the gardens were black with frost except the few pansies which were sometimes found under the sheltered china-astor stalks.

Choosing a College.

Of the many points which should be taken into consideration in choosing a college, one of the most important is that of the size of the institution. I am of the opinion that it should be rather small; that is, with an undergraduate body of about two hundred and fifty students. There are a number of reasons for this. In the first place, in a small college like this, a student who has exceptional powers in any branch of interests has more opportunity to come to the fore, and make the most of himself. For example, if a man is an unusually good runner, although he does not know it, and has not been well-developed, if he is in a small college, he is more likely to go out for track and find out what he can do, than if he is in a large university, discouraged by the great number of

athletes around him who are, as this student thinks, so much better than he. Thus he does not try himself out, and some excellent material is wasted. If he had been in a smaller college, he would have tried himself out, and would have developed into a runner worth while, and would have done both himself and his Alma Mater good. On the other hand, if a man is exceptionally bright, and good at his studies, if he is in a smaller college, he will have more opportunity for the individual attention of the instructors, than if he were in a large university, where, besides being distracted from his work by the multifarious interests of a large institution he is prevented from close contact with the professors who have to teach large classes and are hindered from much outside help of the students by the excessive burdens of administrative work.

Before the Renaissance, artists and sculptors made their statues and pictures thin, and weak looking figures. They saw absolutely no beauty in the human body. At the time of the Renaissance, artists began to see beauty in muscular and strong bodies, and consequently many took warriors as subjects for their statues. Two of the statues that Michel Angelo, the great sculptor and artist, made, Perseus with the head of Medusa, and David with Goliath's head, are very similar. They show minutely and with wonderful exactness every muscle of the body. Michel Angelo was a great student of the body, especially when it was in a strained position. The position of the figures on the tomb of Lorenzo the Great is so wonderful that one can almost see the tension of the muscles.

When I awoke, all was dark except for a round, queer looking thing, directly above my head. It resembled a pale blue moon, far away in the hazy distance. At other times it looked like a shining silver dollar, right over my nose. I lay, musing on this thing, for a while, when, suddenly, like a clap of thunder, I realized that I was engulfed in snow, and the "round, queer looking thing" was a little hole in the top of my small abode, through which my breath passed. I shot my fist upward, and after several blows in different parts of my roof, I succeeded in extricating myself. Bursting as I did from almost complete darkness into an atmosphere of dazzling whiteness and light, blinded me. But I had no

time to think of purple and blue spots dancing before my eyes, for it was freezingly cold, and I popped quickly back to my warm blankets; but only to quick! Snow was down my back in an instant!

A summer session should not be instituted in the High Schools of New York City because it would be physically and mentally detrimental to the pupil. It is self-evident that all human beings as well as animals require, if they would keep in health, a rest from the monotonous toil of the day. This is especially needed when the weather is so warm that one feels that he is carrying a burden by merely existing. To add to the burden of a mere existence, the tiresome labor in a poorly ventilated school-room in the close city, would certainly culminate in a nervous breakdown. Ten months of mental labor is as much a strain as any healthy person can withstand. To do the school work properly, one also has to be in good physical condition, for as some one has said "a healthy mind rests within a healthy body." The country air and freedom for at least two months is the best and only way to effect a healthy constitution.

QUALITY 84

Venus of Melos.

In looking at this statue we think, not of wisdom, or power, or force, but just of beauty. She stands resting the weight of her body on one foot, and advancing the other (left) with knee bent. The posture causes the figure to sway slightly to one side, describing a fine curved line. The lower limbs are draped but the upper part of the body is uncovered. (The unfortunate loss of the statue's arms prevents a positive knowledge of its original attitude.) The eyes are partly closed, having something of a dreamy languor. The nose is perfectly cut, the mouth and chin are moulded in adorable curves. Yet to say that every feature is of faultless perfection is but cold praise. No analysis can convey the sense of her peerless beauty.

QUALITY 90

The courage of the panting fugitive was not gone; she was game to the tip of her high-bred ears; but the fearful pace at which she

had just been going told on her. Her legs trembled, and her heart beat like a trip-hammer. She slowed her speed perforce, but still fled industriously up the right bank of the stream. When she had gone a couple of miles and the dogs were evidently gaining again, she crossed the broad, deep brook, climbed the steep left bank, and fled on in the direction of the Mt. Marcy trail. The fording of the river threw the hounds off for a time; she knew by their uncertain yelping, up and down the opposite bank, that she had a little respite; she used it, however, to push on until the baying was faint in her ears, and then she dropped exhausted upon the ground.

I suppose none of us recognize the great part that is played in life by eating and drinking. The appetite is so imperious, that we can stomach the least interesting viands, and pass off a dinner hour thankfully enough on bread and water; just as there are men who must read something, if it were only Bradshaw's Guide. But there is a romance about the matter after all. Probably the table has more devotees than love; and I am sure that food is much more generally entertaining than scenery. Do you give in, as Walt Whitman would say, that you are any less immortal for that? The true materialism is to be ashamed of what we are. To detect the flavor of an olive is no less a piece of human perfection than to find beauty in the colours of the sunset.

QUALITY 94

A Foreigner's Tribute to Joan of Arc.

Joan of Arc, worn out by the suffering that was thrust upon her, nevertheless appeared with a brave mien before the Bishop of Beauvais. She knew, had always known that she must die when her mission was fulfilled and death held no terrors for her. To all the bishop's questions she answered firmly and without hesitation. The bishop failed to confuse her and at last condemned her to death for heresy, bidding her recant if she would live. She refused and was led to prison, from there to death.

While the flames were writhing around her she bade the old bishop who stood by her to move away or he would be injured. Her last thought was of others and De Quincy says, that recant was no more

in her mind than on her lips. She died as she lived, with a prayer on her lips and listening to the voices that had whispered to her so often.

The heroism of Joan of Arc was wonderful. We do not know what form her great patriotism took or how far it really led her. She spoke of hearing voices and of seeing visions. We only know that she resolved to save her country, knowing though she did so, it would cost her her life. Yet she never hesitated. She was uneducated save for the lessons taught her by nature. Yet she led armies and crowned the dauphin, king of France. She was only a girl, yet she could silence a great bishop by words that came from her heart and from her faith. She was only a woman, yet she could die as bravely as any martyr who had gone before.

QUALITY 95

If finally we ask what are the limitations of Aristotle, we find none save the limitations of the age and city in which he lived. He lived in a city-state where thirty thousand full male citizens, with some seventy thousand women and children dependent upon them, were supported by the labour of some hundred thousand slaves. The rights of man as such, whether native or alien, male or female, free or slave, had not yet been affirmed. That crowning proclamation of universal emancipation was reserved for Christianity three centuries and a half later. Without this Christian element no principle of personality is complete. Not until the city-state of Plato and Aristotle is widened to include the humblest man, the lowliest woman, the most defenceless little child, does their doctrine become final and universal. Yet with this single limitation of its range, the form of Aristotle's teaching is complete and ultimate. Deeper, saner, stronger, wiser statement of the principles of personality the world has never heard.

Standard Scores for the Hillegas-Thorndike Scale. The following scores have been derived for ratings of compositions written by over 5000 pupils, including the reports of the Surveys of Salt Lake City, Utah, and Butte, Montana.

Grades	4	5	6	7	8
Scores	26.0	31.0	36.0	41.0	46.0

HARVARD-NEWTON SCALES

The Harvard-Newton scales are composed of four scales, one for each of the four types of composition: narration, description, argumentation, and exposition. Each scale is composed of six steps with one sample for each step. These scales were derived by obtaining a large number of compositions written by pupils in the eighth grade. These compositions were marked by the percentile method by twenty-four teachers. The value assigned to each sample is the consensus of the marks thus obtained which range in value from approximately 45% to 95%. In rating compositions, these scales are used in the same manner as the Hillegas-Thorndike scale.

The chief advantage of the Hillegas-Thorndike scale is that the samples are scaled more accurately and more scientifically than those of the Harvard-Newton scales. The advantage of the latter is the fact of having a separate series of samples for each type of composition.

Neither of the scales has been used on a sufficiently extensive basis to demonstrate their value, but the probability is that, with practice in using them, the evaluation of composition work can be made more accurately and more objectively. A test made with twenty-four compositions written by sixth and seventh grade pupils on the subject "Roads" showed that the mean variation of the ratings made by twenty-four teachers by the ordinary percentile method was 7.8 and the mean variation of the ratings made by the Harvard-Newton scales was 6.6. Both mean variations are expressed in terms of units of the Harvard-Newton scales. The difference is small, but it is in favor of greater uniformity of evaluation by the scale. The advantage would probably increase with the use of the scale. None of the teachers had ever used the scales before.

THE HARVARD-NEWTON COMPOSITION SCALE FOR DESCRIPTION

No. 1 — 95%

A STORM IN A FISHING VILLAGE

It was a cold damp day in November. The sky was a heavy leaden color. In the east a black line stretched across it foretelling the coming of a storm. The houses across the way were dismal shadows — flat, cold, heartless. A piercing chill penetrated to the bone. The rattle of a grocer's cart or the clatter of a horse's hoofs, seemed cold. The pedestrians were all clothed in black, or else

the feeble light made them seem so, and they were cold — everything was cold, cold, cold. An awful loneliness pervaded all.

The black line in the east had grown into a cloud and was coming nearer, nearer, over the sea. Suddenly a gust of wind shook the very foundations of the houses, — another, and then a continuous blowing. The howling was horrible. Great sheets of foam were blown into the streets, — here and there a piece of wreckage hurled itself against a cottage. Fishermen's wives hurried down the narrow streets to the shore, straining their eyes for any sign of a wreck. Old seamen looked at the roaring sea and shook their heads.

By this time the black cloud engulfed the sky. The day was like night, although it was not yet noon. Boys ran about with torches which were immediately extinguished, and the roaring called to mind the last day of Pompeii.

Rain had begun to descend. At first only drops fell on the hardened faces of old mariners, and on the pale countenances of wives, mingling with the drops already there. But soon great sheets fell, forcing the people indoors, to the poor shelter afforded by the groaning houses.

For about an hour the storm continued thus, then by degrees the wind lessened, though the rain still fell, and the ocean thundered. But soon the rain also slowly stopped and the roaring ceased. The black cloud rolled slowly away, leaving the tardy sun to shine on the drenched town and the great piles of wreckage on the shore.

MERITS: This theme ranks high because the writer has a clear picture of the scene and has used words and phrases that bring the details of this picture clearly before the reader. There are good color images in such expressions as "leadens," "a black line," "great sheets of foam," "the day was like night," and "the sun shining on the drenched town." Sound effects are strikingly brought out by such phrases as "the rattle of a grocer's cart," "the howling," "the wreckage hurled against the cottage," "the roaring sea," and "the thundering ocean." The sensation of dreariness and chill is conveyed by the repetition of the word cold. The confusion caused by the storm is reflected in the anxious look of the wives of the fishermen. A further human touch is added in the mention of such details as "the extinguished torches carried by the boys" and "the drops of rain falling upon the hardened faces of the old mariners." All these enumerations fittingly combine to produce a tone of coldness, desolation, and anxiety. The details are told in their natural sequences. This chronological arrangement has helped the writer to keep safely to his main point and effectively connect the details with each other.

DEFECTS: the repetition of the word "cold," while effective in bringing out the sensation, is somewhat artificial. "Loneliness" is misspelled; a semicolon should supplant the first comma in line 6. Omit the comma in line 5.

COMPARISON: The theme is superior to No. 2 in its richness of imagery, its wealth of details, its depth of feeling, its maturity of style (seen in the sentence-structure and the vocabulary), and its mastery of mechanical forms.

No. 2 — 85%

GRANDMOTHER

In the front of the open fireplace in a large armchair there sits our old Granny. She is old and feeble. Her hair is snow-white and over her head a little white cap is carefully tied. Her face is full of wrinkles and her keen blue eyes sparkle through a pair of glasses which she has on her nose.

She has a shawl thrown over her shoulders and she also wears a thick black skirt. On her feet can be seen a pair of soft slippers which she prizes very much because they were given her for a Christmas present.

As you know Grannies always like to be busy, our Granny is busy knitting gloves. Her hands go to and fro. She will keep on working until her knitting

is done. Now that it is done she carefully folds her work and packs it into her work-basket. Then she trots upstairs to bed, and oh, how lonesome it is when our dear Granny is gone from the room.

MERITS: The merits of this composition are: (1) the clear and pleasing impression obtained; (2) the happy choice of details and the logical sequence of their arrangement; (3) the sympathetic treatment of the subject — for example, bits of sentiment seen in the grandmother's attachment to the slippers, and the loneliness felt when she goes to her room; (4) the interesting introductory sentence; and (5) the mechanical accuracy.

DEFECTS: The defects are: (1) the rather monotonous sentence structure, and (2) the childish vocabulary.

COMPARISON: To justify its place in the scale note: (1) that in No. 1 there is successfully treated a much more difficult subject; (2) there is a greater power of imagination; and (3) there is a greater variety of sentence structure and a richer vocabulary.

No. 3 — 75%

A MANSION

As you look across the road you will first see a long private avenue or walk. It is in the summer, and on each side of this long walk are some beautiful, stately elms. They are hundreds of years old and they have done their duty for as many years, shading the walk from the noon sun.

Cross the road and you will see if you look up the avenue, a beautiful mansion. It is a colonial house and four large pillars are upholding the roof. A piazza runs along three sides of the house.

Near the house is a tennis court where for years the occupants of the mansion have passed many an hour.

Let us enter the mansion. It is a beautiful cool place, although dark. As we enter we see large psalms on each side of the entrance. On the floors are old oriental rugs which have been handed down for generations. In the parlor is a harp, and on the walls are the portraits of the ancestors. In all, it is a beautiful place.

MERITS: The writer of this theme has presented a clear though conventional picture. Although he changes his point of view several times, he has attempted to put his readers into the best positions to see the mansion. The choice of words is fair. Such details as the stately elms, the oriental rugs, the harp, and the portraits are well selected. Only one mistake in spelling occurs (line 11).

DEFECTS: There are, however, too many paragraphs for such a short theme. Constant repetition of the pronoun "you" and of the words "beautiful" and "mansion" give an impression of monotony and of limited vocabulary. The pupil has evidently a definite place in mind, but has not suggested the spirit of the scene, as has the writer of No. 2.

COMPARISON: The composition deserves its place in the scale above No. 4 because of better sentence structure and more orderly arrangement. It is inferior to No. 2 on account of its somewhat prosaic tone and its constantly changing point of view.

No. 4 — 65%

THE LAKE AT SUNRISE

In the Mountains of Pennsylvania there is a lake.

On one side of the lake is a boat landing, at which a dozen or more boats are tied up. On this boat landing one may stand and look up the lake, at sunrise,

and see the sun peering up over the top of the mountains and shinning on the water. Then a King Fisher flies down the lake making his cheerful noise, instantly, all the other birds begin to chirp as if their life depended on it.

Looking across the lake one would see numerous wells and coves backed up by woods from which comes the chirp of the birds. Hearing the explosions of cylinders we look to see where in comes from and find a pumphouse that keeps the lake supplied with water.

Looking down the lake over the dam to the ice house with the roof sparkling with. On the roof of the house a hawk is sitting adding his clear whistle to noise of other birds.

Looking around to the woods, at our back, with an old oil well in front of them. The birds flying from the woods in flocks, and far away from the hills comes the sound of the of Italians singing.

MERITS: The writer has seen and heard concrete details and has recreated his images clearly. He has tried, too, to make his point of view obvious to the reader. His vocabulary is adequate.

DEFECTS: As a description the composition fails because there is no unified picture of the lake. The selected details, clear in themselves, tend to distract rather than center the interest. There are numerous mechanical errors: there should be no commas after "lake" or "sunrise" (line 3); "shining" (line 4) is misspelled; there should be a period after "noise" (line 5) and no comma after "instantly" (line 6), which should commence with a capital; in (line 9) "in" is not correct; the groups of words in (lines 11, 12) and (lines 14, 15) do not make sentences; the word "the" is omitted before noise (line 12) and the word "are" before "flying" (line 15).

COMPARISON: The theme merits its rank in the scale by superiority in spelling, paragraphing, and maturity of thought. It does not, on the other hand, show equal mastery in the fine details, the discriminating vocabulary, and in the ability to stick to the point. The sentence-sense is faulty.

No. 5 — 55 %

A LIGHT HOUSE

A description of a light house is quite interesting.

First a light house is generally situated on a mass of rocks in the ocean or on some great lake. And then to get into a light house is a question. Some times you have to climb to the top on a steal ladder, and again you only have to go half way up and you find sort of a steal porch which is very strong with a door in the side of the light house. On the very top of the light there is generally two or three life boats in case of accidents. In side there is an enormous light which flashes every two minutes and sometimes more often it depends holly on the weather. The man himself has very favorable sleeping quarter and food it is a very lonely life except when you have a man with you. Sometimes they play cards all day long until it is time to fix the lights and then they are very busy.

MERITS: The merits of this theme are: (1) the evident spirit of faithful accuracy; and (2) a successful use of certain simple words, — such as "mass of rocks," "enormous light" and "lonely life."

DEFECTS: Many obvious defects warrant its low position in the scale. The pupil was asked to write a description. After announcing his purpose to do this, he writes an exposition, or explanation of light houses in general. The first sentence of the theme is worthless, contributing nothing toward the development of the subject. It should be omitted. The paragraph is full of misspelled words and grammatical slips: "steel," "inside," "wholly," "sometimes," "sleeping quarter." The most striking weakness of the words is the loose and rambling form of the sentences, indicating indefinite thought. "Run-on" sen-

tences are found in lines 8-11. No attempt has been made to establish a point of view. On this account, and because of a lack of vivid words, the passage is dead and colorless.

COMPARISON: The composition is placed above No. 6 because it contains fewer mechanical errors.

No. 6 — 45%

A SCENE ON THE PRAIRIES

Along a large plain in the west with mountains on all sides. The sun was just sinking behind the mountains. Some trappers were on the plain just about to get their supper. They had one tent because there was just three of them. Beside their tent tripled a little spring. After the three trappers had eating their supper they sat down by the fire because it had growing dark. All of a sudden a bunch of Indian's came riding up. When they came near they fired off their guns and disappeared in the darkness and the trappers turned into camp leaving one of the trappers on guard.

MERITS: The commendable features of this composition are directness, simplicity, and a logical arrangement of details. The writer passes from the general to the specific in a natural manner. In spite of a change in the point of view in the last two sentences, the paragraph, as a whole, makes a clear picture.

DEFECTS: Blunders in grammar and in spelling, lack of sentence-sense, and short, chil-ish sentences make the rating of the composition necessarily very low. Such errors as "tent" for "tent," "tripled" for "trickled," "eating" for "caten," "growing" for "grown," and the misspelling of "Indians" indicate either hasty, careless work, or slovenly habits of enunciation.

COMPARISON: Compared with the descriptions of the storm and of grandmother, the short sentences here show immaturity and weakness rather than skill or force. With a large amount of correcting of mechanical details, but with very little revising as a whole, this paragraph would be superior to No. 5.

THE COMPLETED EXPOSITION SCALE

No. 1. "A" Grade Composition. Value, 91.8%

EXPLANATION OF STANDARD TIME

Standard Time is used in the United States to avoid great differences in time between cities. In travelling from our eastern to our western coast one would find on arriving that his watch was three hours too fast. The cause for this is that the sun's rays strike the Atlantic coast three hours sooner than they do the Pacific coast.

Formerly each city had its own sun time or Local Time, which was a great inconvenience to travellers and more so when railroads were established.

This trouble has been wholly avoided by dividing our country into time belts. There are five consecutive belts which bear names that refer to the land which they cover.

The belt which is farthest east is called the Colonial Time belt. The belt which includes New England and New York is named the Eastern Time belt while the belt that passes through the midst of our country is named the Central Time belt. The remaining two are the Mountain and Pacific Time belts; the Mountain Time belt is centered around the Rocky Mountains while the Pacific Time belt includes our western coast.

There are three hundred and sixty degrees which the sun has to cover in one

day or twenty-four hours, therefore the sun overspreads fifteen degrees in one hour; for that reason the distance between each belt is fifteen degrees.

The Eastern Time belt starts on the 15th meridian, the Central on the 90th meridian, the Mountain Time belt commences on the 105th meridian while the Pacific Time belt begins on the 120th meridian. Now when one goes from our eastern to our western coast he has to set his watch back one hour at every fifteenth meridian.

MERITS: The merits of this theme are: (1) an orderly and well-arranged presentation of facts; (2) a mature use of connective words and easy transitions between paragraphs; (3) a marked variety of sentence structure; (4) a careful choice of words to avoid repetition; (5) an almost complete absence of serious mechanical errors.

DEFECTS: There should be two or three paragraphs instead of six. There are one or two obvious misstatements of facts. In the last paragraph a semi-colon should stand after twenty-four hours.

COMPARISON: This composition is superior to No. 2 in its greater maturity and variety of expression, and in its efficient handling of a more difficult subject.

No. 2. "B" Grade Composition. Value, 82.0 %

HOW TO MAKE FUDGE

A very common and well liked home made candy is Fudge. It is very easily and quickly made.

To make it, put two cup-fulls of sugar, four teaspoonfuls of cocoa, a piece of butter about the size of a walnut, and three-fourths of a cup of milk into a small kettle.

Place this on the stove to boil until, when a small amount of it is dropped in a glass of cold water it will form a ball. Stir it while boiling.

As soon as it will form a ball in water take it from the stove and add two teaspoonfuls of vanilla. A cupful of ground English walnuts or cocoanut may be added, also, if desired.

Then pour it into well buttered tins and let cool before cutting it into pieces. Cut the pieces about an inch square.

If these rules are followed accurately the candy will harden and be very good.

MERITS: "The writer of this theme evidently knows how to make fudge and has stated the method simply and clearly. The words are well chosen and the sentence structure good. Evidence of a plan is shown in the introduction and conclusion, as also in the logical arrangement of details."

DEFECTS: The words cupfuls and teaspoonfuls are misspelled; there is a shifting of mood from indicative to imperative; the theme should be in one paragraph.

COMPARISON: This theme is not so good as No. 1 because of its poor sentence structure and lack of excellence of style. It is better than No. 3, because it is a clearer exposition.

No. 3. "C" Grade Composition. Value, 71.4 %

HOW TO GIVE A DINNER PARTY

After you have sent out invitations for your dinner the arrangement of the table is the first thing to decide. The center piece may be flowers or anything desired.

After that has been decided upon, the courses are the next thing to decide upon. It depends on the courses what silver and china are used. Always the

knives are placed on the right with the spoons, which are arranged in the order of which you use them the first one being nearest the plate. The forks are at the left of the plate in the same order as the spoons. The glasses are at the right above the knife. The napkins are at the left beside the forks. The maid serves the person left of the hostess first.

When the dinner is ready the guests assemble, but before entering the dining-room the men draw from a box or hat, which contains the names of the ladies present, one of the names, the one he draws he escorts into dinner he seats her first then sits at her left.

MERITS: This theme, with the exception of one or two sentences, is arranged in an orderly fashion, and leaves a clear impression on the reader's mind. There is a fair knowledge of paragraph structure. The spelling is accurate.

DEFECTS: There are, however, numerous faults. Only the third paragraph pertains to the title of the composition: the first and second tell how to prepare for a dinner party. There is room for improvement in paragraph structure: paragraphs one and two should be combined. The use of short sentences is monotonous. There are two "run-on" sentences in the last paragraph. The repetition of the words decide upon is unpleasant. The use of pronouns is lax: you is used for one in lines 1 and 8; and one is used ambiguously in line 16.

COMPARISON: The theme is ranked higher than No. 4 because it is more coherent and the sentence structure is better. Because the sentence structure is more monotonous, and because it is not so well punctuated, the theme is placed lower than No. 2.

No. 4. "D" Grade Composition. Value, 61.0%

HOW TO BUILD A FIRE

To build a furnace fire you must as the following instructs. First, you must rake down and take out all the cinders, clinkers and ashes, sift them, so as to do away with clinkers and ashes and use cinders for some other purpose.

The next step, is to get your material ready to work with. First you put some paper in the furnace, on that some wood, wait until the wood is blazing, then take three good-sized shovels full of small coal and put it on that. Take the same amount of big coal repeating the same process. A fire like this is supposed to last eight hours. The next thing to do is to open all your drafts to let the air in and all the gas and smoke out so as the fire will progress quicker. Last of all investigate your work to see if it is allright. Your task is done.

MERITS: This theme shows clear thinking and a mastery of the details that make the whole convincing. The writer has evidently built furnace fires and relives the process as he writes. His vocabulary is thoroughly suited to his theme.

DEFECTS: The writer has shown no care in revising his theme. There is an obvious omission in the first line, careless sentence structure in the second paragraph, and a misspelling of all right in the last line. The sentence commencing "A fire like this" is an intrusion — an offense against coherence. The last sentence may be omitted.

COMPARISON: This theme is thinner in subject-matter than No. 3 and is more obviously lacking in a sense of style and form. A firm grasp of the elementary principles of composition secures its place above No. 5.

No. 5. "E" Grade Composition. Value, 52.6%

HOW TO HARNESS A HORSE

When you get the horse out of his stall, the first thing to do is to get the bridal on him. On putting the bridal on you first take hold of the piece of the bridal

that goes around his neck and then take hold of the bit in the other hand. You then take hold of the lower part of his mouth and pull it down and then slip the bit in his mouth. The bit is the iron piece on the bridle. When you get the bit in his mouth you tie the strap around his neck. Then take the collar and put it over his head on to his neck. The last thing to do is to put the saddle on, throw the saddle over back and buckle the inside strap on the to the other side, of the saddle, you put it under his stomach to buckle it and you have to have it good and tight.

MERITS: The merits are three in number: (1) the writer knew how to harness a horse; (2) he has given his directions in an orderly manner; (3) he has kept to his subject — has omitted all unnecessary details.

DEFECTS: The defects are as follows: (1) the ideas are crudely and awkwardly expressed; (2) the vocabulary is meager, as shown for example, by the frequent repetition of bridle and saddle; (3) bridle and stomach are misspelled; and (4) the last sentence is ungrammatical and crude — it should be recast.

COMPARISON: This theme precedes No. 6 in the scale, because it is superior in sentence structure, spelling, and clearness. It is inferior to No. 4 in vocabulary and mechanics.

No. 6. "F" Grade Composition. Value, 39.1%

HOW TO HARNESS A HORSE

I am going to tell you how to harness a horse. First you led him out of his stall take off his halter then put on his collar then put on his bridle put on his saddle. Then led him out to the team back him up in to the shafts left them up put them into the sockets on the saddle then tie up the shaft strap then fix the traces to the whippel tree then the bretchen then the cheet reins then run the reins through the holds in the saddle back to the team.

MERITS: Only two things can be said in commendation of this theme: the first sentence is free from mechanical errors, and the directions for harnessing a horse are given in logical order.

DEFECTS: The theme has many faults. The meagerness of the writer's vocabulary, made conspicuous by the childish repetition of then and put; his utter lack of sentence sense; his inexcusable errors in spelling, such as "led" for "lead," the for then, left for lift, tie for tighten — all these illiteracies make the theme rank low.

COMPARISON: This theme is inferior to No. 5 in spelling, punctuation, and sentence structure. With its bare enumeration of the steps in the process of harnessing a horse, it completely lacks the slight elements of grace which dependent clauses and fuller explanations contribute to No. 5.

THE COMPLETED ARGUMENTATION SCALE

No. 1. "A" Grade Composition. Value, 93.2%

IS A YEAR OF TRAVEL MORE ADVANTAGEOUS THAN A YEAR OF STUDY

Yes. In nearly all lines of study, travel is an important aid.

Geography for instance. Places dryly discussed in class and soon forgotten become actual. Races that made no impression in print are fastened in the mind by a hundred vivid pictures. Products that seemed so useless and annoying to learn are full of importance and interest when seen being loaded on ships or mules.

Queer oriental customs, laughed at when studied become natural, comprehended facts. Statistics are seldom learned while travelling, but when they are, they are remembered because the bare, dry fact is connected with an actual thing — not merely figures, groaned over because they were difficult to learn.

History also. Some spot where General A's army manoeuvred in this direction, and Colonel B's in that, becomes real ground, to be revered and remembered. The hills that would get on the wrong side of the diagram are here in their true position, and that granite monument marks the spot where the brave commanders died.

Languages, too. An impossible French name slides off glibly when often heard. Some word is gained with very little effort, another, and the door to the whole language is thrown wide. The same is true of Italian, and the best part of it is that the pronunciation is correct.

Mathematics could not be so easily acquired, it is true, as in the schoolroom. But when the mind has been broadened by the year of travel, the student would more easily learn this branch.

As for English, a year like this would be the greatest advantage possible. The landscapes of Switzerland or Italy, the odd manners of the Orientals, the thousand types of humanity — everything lends its aid.

On the whole, travel is a thousand times an improvement over the school, because it creates interest, stimulates thought, and broadens the traveller as nothing else can.

MERITS: This theme is excellent because the writer has his argument clearly in mind, follows a carefully planned outline, and expresses himself convincingly. The question is stated clearly, and the conclusion leaves a definite impression on the reader's mind. The illustrations used are well chosen and vivid, especially the ones about foreign customs and historical scenes. Vocabulary and sentence form are good.

DEFECTS: A different arrangement of arguments in the order of climax would add strength to the theme. The beginning of each paragraph is awkward because of the use of detached phrases and words: i. e., yes; geography for instance, languages too. Either these phrases should be deliberately isolated as headings, and the whole paper thrown into outline form, or else they should be expanded into complete statements. There is some weakness in punctuation, as for example, a semicolon should be substituted for the comma after effort in line 22.

COMPARISON: This theme is better than No. 2 because it follows a more definite plan; its arguments are more clearly stated, and its vocabulary is more varied.

No. 2. "B" Grade Composition. Value, 81.5%

WHY COUNTRY LIFE IS BETTER THAN CITY LIFE

Country life is the best kind of life there is to be lived.

The country is good for children and grown up people alike. The children have plenty of fresh air and room to run about in. To be sure they do not have the large schools of the city; but they have the great school of Nature and that is greater than any learning they could get in city schools. The parents are not afraid to let them run about because there are no automobiles, electric cars, etc., to run over them. There is safety in the country.

The country is the best place sick people could go. The air is pure and bracing and there is water cool and fresh from the spring or well. For the tired man working in a busy city office a rest in the country is the best thing for him and the sooner he gets it the better it is for him.

The country people have good times even if they don't go to fancy balls, theatres, etc., and stay up until one or two o'clock in the morning. They have a good healthy time and are home and in bed by nine or half-past.

For these reasons, and many others, the country is the best place for children or adults, sick or well.

MERITS: The writer has a sense of arrangement, shown (1) by his introduction; (2) by his paragraphs that develop successively the advantages of country life; and (3) by his conclusion. The composition is also correct in its elementary mechanics — spelling, punctuation, grammar, and paragraph and sentence structure. The vocabulary, while not distinctive, is adequate.

DEFECTS: The arguments are not wholly convincing. For example, the great school of Nature is, for most children, not a satisfactory substitute for a city school. Then, to say without qualification, that the country is the best place for sick people to go, is misleading. The repeated use of etc., is ineffective. The summary should not contain the phrase "and many others."

COMPARISON: This composition lacks the virility of thought and diction that marks No. 1. It is, however, superior to No. 3 in arrangement, in sentence structure, and in its firmness of mental grasp.

No. 3. "C" Grade Composition. Value, 71.9%

THE GOOD OF A LANTERN IN GEOGRAPHY

A lantern is a good thing in a school as it shows the different cities, countries, and also the ways of the people. This gets the children acquainted with foreign places. Also the reciting about the pictures gives them an interest which would not be so great as if they were in the schoolroom.

It is a good thing for the children to get up before the class and recite, that gives them self-confidence and also prepares them more for high school. In having the lantern it interests the children so they look for pictures to use, and they find and read many interesting things.

When the pictures are passed out they look up many things at home and find out new things and so as other children find things out they help the class.

MERITS: The merits of this composition are three: (1) the form is purely argumentative throughout; (2) the pupil had a few distinct advantages of the use of a lantern in mind; and (3) troublesome words like acquaintance and foreign are correctly spelled.

DEFECTS: The defects are as follows: (1) poor arrangement of facts makes this theme ineffective; (2) the sentences are awkward — for example the third and fifth; (3) the fourth sentence illustrates the "run-on" sentence or "comma error"; (4) there is lack of clearness in the antecedents of pronouns — "they" in lines 4, 9, and 10; (5) there is a poverty of vocabulary — the word "thing" or "things" occurs six times, and "children" occurs in almost every sentence.

COMPARISON: This theme follows No. 2 in the scale because it has less mature thought, inferior sentence structure, and a more limited and childish vocabulary. It precedes No. 4 because, although not so effectively written, it adheres more closely to the form of writing required — argumentation.

No. 4. "D" Grade Composition. Value, 63.6%

FOOTBALL IS A BETTER GAME THAN BASEBALL

Football is a better game than baseball. It's not only (only) muscle and strength that makes a football player. He must have the power to think quick. When the team is a short distance from the goal and scores, somebody's quick thinking has done it.

Baseball is an exciting game in parts. But football is exciting from the (the) time the ball is kicked till the referee blows his whistle. Football shows when a man or boy has grit. I once attended a game. The score was tie and the op-

posing team were only a few yards from the goal and three minutes to play. The quarterback gave his signal and they struck the line. The struggling mass moved a few feet and stopped with a jump. Out of the mass a man jumped. His face was all battered, but he struggled on till he had got the ball over the line. Some people call it brutal. Some cases it is and some it is not. I would rather strike the line in football clothes for a few yards gain, than stand up at a plate and a man hurl baseballs at me. Which would you rather do?

MERITS: The writer of this theme evidently has a plan of procedure in mind. After clearly stating his proposition in the first sentence, he seeks to establish three good points of superiority for the game of football. Though unable to prove these points, he has succeeded in leaving with the reader a firm conviction of his belief that football is a good sport. Lines 7-13 give effectively the writer's impressions of a critical moment in a game.

DEFECTS: The author fails to prove his proposition, because he mistakes for arguments a few loosely stated facts and preferences. His plan of reasoning, though suggested, is entirely undeveloped. Mechanical errors are numerous: (1) two mistakes in the use of parentheses (lines 1 and 5); (2) plural verb with singular subject (line 8); (3) adjective modifies a verb (line 2); and the pronoun "it" is used vaguely in line 12. The paragraphs are without system, and the sentences in general are short and disconnected.

COMPARISON: This composition deserves its place in the scale above No. 5 because of its superior mechanical accuracy and larger vocabulary. It does not hold as closely to its subject as does No. 3.

No. 5. "E" Grade Composition. Value, 52.3%

WHY EVERY GIRL SHOULD LEARN TO COOK

Every girl should learn to cook. If she was out of imploiment it would be very useful.

Later on, if she should keep house she would want to be able to cook. If she didn't know how, the lady would have to hire a cook. Sometime, perhaps, she could not pay to keep a cook. Then she would say, "Oh, how I wished I learned to cook when I was younger, instead of buying bakers things."

If this womans children wanted to learn to cook who would they ask to learn them. Their mother couldn't, because she didn't know how her self. So you may see for yourself it is very important that every girl should learn to cook.

MERITS: This theme shows that the author had a plan; for it gives several sound reasons why every girl should learn to cook — reasons arranged in a fairly logical order. The punctuation of certain sentences is unexpectedly good.

DEFECTS: The theme is, however, faulty in unity and coherence. There is a shifting of tense, a lack of definite antecedents for such words as "it" (line 1), and "lady" (line 4). The arguments are not sufficiently expanded to make them clear. The theme is further marred by such mechanical errors as: misspelling of employment (line 1); a complete absence of the apostrophe and interrogation point; the incorrect use of "who" (line 7), and "learn" (line 7).

COMPARISON: This theme is placed lower in the scale than No. 4; it has less force as an argument, and has more mechanical errors.

No. 6. "F" Grade Composition. Value, 47.0%

THE WINTER IS THE BEST SEASON

The winter is the best season in the year because they are skating and pungriding coasting, etc. In the spring when you plant the crops you are kept busy.

In the summer taking care of them weeding in them and picking bean peas, and the only day you get of is Sunday.

In July it is too hot you swet all the time the horse won't run because it is so hot. In the fall you are busy get in all the crops and cutting corn banking celery, digging potatoes, pulling turnips, picking apples, pears, cutting onions and every thing else. So the winter is the only time you can have fun when they are nothing to do.

MERITS: There is little to defend in this theme. Only one line of argument is attempted; that one, however, is arranged logically according to the order of the four seasons. The use of specific words is good, and the large number of illustrations drawn from the pupil's own experience arouses sympathy in the reader.

DEFECTS: Although the range of arguments is limited, and those arguments consist mainly of the enumeration of the woes that beset a boy in the other seasons rather than in the joys of winter, it is from the mechanical standpoint that this theme is a failure. There is manifested an entire lack of sentence-sense since examples of both "run-on" sentences and unfinished clauses occur frequently. Errors in spelling, punctuation, and grammar are found in every line. The whole composition is the expression of a backward, limited mind.

COMPARISON: The theme deserves a lower place in the scale than No. 5 because of the greater frequency of mechanical errors. In weight of subject matter, however, it is superior.

THE COMPLETED NARRATION SCALE

No. 1. "A" Grade Composition. Value, 93.5%

*MY FIRST RIDING LESSON*¹

I gazed down into the riding ring from the balcony where I was sitting. The riding master was cantering around the ring with a young girl who seemed to be an experienced rider. Riding looked easy.

After another round he rode up to the doors which a man outside flung open, and rode out. A few minutes later he called up the stairs, "I am ready for you, Miss Speare," and taking my crop I rushed eagerly down the stairs, for this was my first riding lesson.

I scrambled on to the back of a small horse that stood patiently quiet, waiting.

"Are your stirrups all right?" the riding master asked, when I was on.

"Yes," I replied. "They are just the right length."

"That's good," and he leaped into the saddle and we rode into the ring.

"You have not ridden before, have you?" he asked as we walked slowly around the ring.

"No," I replied, "I haven't." "But I was thinking to myself how easy riding is!

"We will trot now," he said, after a little and the horses began to trot slowly.

Then I discovered my mistake. Riding is not especially easy for beginners. And trotting is not as easy as walking.

"Rise with the horse," he commanded. "Cling on with your knees and rise in your stirrups."

Easier said than done. I bounced up and down until I thought I should fall off. It looked so easy when other people trotted! He seemed to do it so easily, why couldn't I? Yet I couldn't and that was plain.

"I c-can't s-seem to r-rise with h-him. H-he b-bounces m-me awful," I gasped finally. He pulled in and we walked for a while.

¹ Composition No. 3 in the complete set.

"Now try to rise in your stirrups," he said as we began to trot again.

I got along better this time although I still bumped terribly.

Then he discovered that the hour was up and we rode out. He dismounted and helped me off and when I reached the ground I felt very unsteady.

I staggered up the stairs, for I was very wobbly, seized my crop and hurried down. If riding was like this all the time! He was talking to mother.

"All right," I heard him say, "A week from to-day; same time. She did pretty well for the first time. Too bad she is so stiff."

I didn't feel like another lesson at any time but I didn't say so and with mother I left the riding school and my first riding lesson was at an end.

MERITS: The situation is vividly portrayed, with plenty of conversation. From the lively introduction to the direct conclusion, the interest is kept up by well-selected details. The paragraphing is good, and the mastery of quotation marks is evident. Good choice of words is shown in such natural phrasing as "rushed," "gazed," "flung," "scramble," "bounced," "staggered." The connection between the paragraphs is unusually good.

DEFECTS: The defects are in matters of form. There is unnecessary repetition of the word ride. Punctuation is omitted in several places. There are mistakes in spelling (lines 8, 17, 21). In that's good, the apostrophe is omitted. The concluding sentence is loosely constructed.

COMPARISON: This theme holds a higher place than No. 2 because of its excellent choice of details and its vivid expression. It is a more ambitious piece of work, and the interest is more surely sustained.

No. 2. "B" Grade Composition. Value, 83.0%

MY TRIP TO FAIRYLAND

It was about four o'clock in the afternoon, and as I was very tired I sat down by the fire to rest. Suddenly I heard a small voice calling me by name. I immediately looked up and beside me I saw what I thought was a fairy. I was very much excited as I had never seen a fairy but had only read of them.

"Would you like to come with me to Fairyland and rid yourself of your cares for a while?" she questioned.

"I would love to," I answered.

"Then only follow me," she said.

So out of the room we went and down the cellar stairs.

"Where are you leading me?" I asked.

"You shall soon find out," she answered.

We went into the darkest corner of the cellar. She showed me a small trap door which she went through, leaving me alone.

"But how am I to get through?" I asked.

Without a reply she touched me with her small wand, and before I had a chance to say a word I found myself through the door and in a beautiful garden which was filled with fragrant flowers of many kinds. She led me through it, and at one end of it I saw a white marble palace.

"This is my home," she said. Do you care to enter?"

"That would be delightful," I said.

Up the stairs we went and down a long hall. Finally we came upon a large and beautiful room. It was filled with dancing fairies who were having a gay time. My fairy introduced me to some of the fairies, and then joined in the merry making. I stood and looked at the splendor of it all, when suddenly I heard a voice calling me, and I looked up.

It was my mother who said, "I have called you three times. You must have been asleep."

MERITS: The spelling, punctuation, sentence structure, and especially the paragraphing of this composition, are accurate. The story, as a whole, has action; the conversation is well handled; there is a studious effort to avoid repetitions, as questioned, asked, answered, said (lines 6-8).

DEFECTS: The chief defect is a childish use of tiresome short sentences. The verb forms do not produce action enough. In line 19 quotations marks are omitted before *Do*, and there should be a hyphen in merry-making (line 23).

COMPARISON: The superior paragraph structure of this theme is sufficient to place it above No. 3. It lacks the merit seen in the easy and spirited conversation of No. 1.

No. 3. "C" Grade Composition. Value, 76.2%

LOST IN THE WOODS OF CONNECTICUT

"Who's going blackberrying to-day?" cried my cousin Margaret waving her pail.

"I am," I said coming out of the house a pail in one hand and a wide brimmed hat in the other.

"Allright," answered Margaret, "but where's Julia?"

"Must be in the house," I replied.

We soon found her diligently reading a book and after some urging she decided to go.

It was about eight o'clock when we started for if we waited till later on in the day it would be to hot.

We walked a long ways to the other end of the farm after climbing stonewall and having several encounters with snakes.

"How much farther do we have to go?" I cried growing impatient.

"The other side of this field," Margaret called back.

After climbing the stonewall we came in sight of big stretches of blackberries.

We fell to work right away and picked very fast.

In a little while we stopped and found we had worked a good ways. As we went on the berries seemed to grow bigger and sweeter.

After filling my pail I found Margaret was through long before me and was sitting in their midst eating. We waited till Julia was through and then started for home. We were so busy talking Margaret didn't notice which path we took and after walking a long ways she discovered our mistake. I wanted to turn back and go the way we came but she said it would take to long so we struck out into the woods. The farther we went the more perplexed we were till finally Margaret sat down under a tree in despair.

This would never do so I decided to climb a nearby tree to see if we could see any signs of a house.

With much pulling and tugging I got up the tree and saw a house to the right. We reached the house tired and hungry.

We were lucky to come to come to such a place for the mistress proved to be very good. After resting one of the hired men drove us home just in time to see a searching party going out to look for us as it was now late in the afternoon.

MERITS: The most commendable feature of this narrative is the management of the conversation. This is accurately punctuated and contains a variety in the verbs of saying. Placed at the beginning, it gives an element of spontaneity and arouses the immediate interest of the reader. There are several well-chosen expressions — such as "several encounters with snakes," "pulling and tugging," and "in despair." The arrangement of ideas is logical.

DEFECTS: Except for the incompatibility between the content and the title, the defects are mechanical: (1) poor paragraphing except in the conversation; (2) the unskillful use of the compound sentence in the sentences begin-

ning on lines 7, 9, 21; (3) the unemphatic position of the participial phrase in lines 12 and 13, and of the dependent clause in the last sentence; (4) the absence of commas after introductory clauses and phrases, in some instances causing an ambiguity of meaning as in sentences commencing in lines 17 and 31; (5) the grammatical error in the incoherent reference of the pronoun *their* in line 20; (6) the evident carelessness in the spelling of "the," "all right" and "too" and in the repetition of "to come" in line 30; and (7) the poor choice of words in the colloquial "nearby" and in the repeated use of "long ways."

COMPARISON: This theme is superior to No. 4 in its maturity of thought and phrasing; it is inferior to No. 2 in mechanical form.

No. 4. "D" Grade Composition. Value, 66.4%

A HAPPY BUT EXCITING AFTERNOON

Allen had just gotten a new motor-boat for his birthday and wanted to try it out as it was Saturday. "Well," he said, "will you come with me Emily. You can bring Edna if you wish."

"All right" said Emily, and off she went to get Edna, her cousin.

They started out at Marblehead and was going to go as far out in the harbor as they could.

All went well for about one hour, then it was getting rough.

The girls got frightened, but, they had more to be frightened about later, the propeller broke off. All there was to do was to go where ever the waves would take them.

They were heading for open sea. "Oh," said Edna, "how perfectly horrible."

"I'm not coming out in this motor-boat again," said Emily.

"I guess you won't, Emily, but look, here comes a ferryboat."

So it was, "now for the fun," said Allen, who was not the least bit excited, "I'm going to call their attention."

The ship came nearer and nearer to them. Soon it was within reach and Allen made a grab for it. He got hold of the side and helped the girls in. Then he got a rope and tide it to the motor-boat.

"Well," said the girls to-gether, "we will never go in a motor-boat with you again."

MERITS: The merits are two: (1) the child had a fairly well-planned story in mind; (2) he has an accurate knowledge of the use of quotation marks.

DEFECTS: The defects are as follows: (1) the paragraphing is poor; (2) there are several examples of the "run-on" sentence (lines 7, 9, and 15); (3) the words "propeller," "wherever," "together," and "tied" are misspelled; (4) "can" is used in line 3 instead of "may"; (5) in line 5 there is a singular verb used with a plural subject; (6) there are errors in punctuation (lines 2, 9, 11, and 14); (7) the vocabulary is childish.

COMPARISON: This theme follows No. 3 in the scale because of the inferior development of its plot and the greater immaturity of its expression.

No. 5. "E" Grade Composition. Value, 56.0%

A GHOST STORY

"Come Joe, run faster we must get Harry to come with us and we have but few minutes to do it in if we want to get there before dark," said John as he leaped a fence and started toward a house in the distance.

Joe jumped the fence and ran after John as fast as he could in order to catch up with him so they could go in together.

They reached the house all out of breath.

"Hullo boys! where are you going, can I becom company?" were the series of questions poured forth to John and Joe as they entered the house.

John and Joe told them where they were going, and Harry readily consented to go.

They reached the house and ate their supper and went to bed.

They were not asleep long when Joe woke up and hollered for John and Harry to come to him because he saw a ghost.

Harry jumped up and entered the room in which Joe was sleeping.

"Where is the ghost," he asked, "I don't see any."

He is gone now, said Joe. In the morning they thought they would investigate.

The found it was only a white post and a white sheet behind it. They then started home and told their parents about their adventures.

MERITS: The writer has a strong and dramatic opening, and throughout the theme handles his dialogue well. His sense of order is good and his vocabulary adequate. Such expressions as "the series of questions" "poured forth" and "readily consented" are good.

DEFECTS: The good promise of the beginning is not fulfilled; the climax is not worked up successfully and the whole trails off into a pointless incident. The mechanical errors are numerous; almost every sentence is made a separate paragraph; there are two examples of the "run-on" sentence (lines 1 and 15); there are several comma omissions and one use of a comma where there should be a question mark (line 15); there is an error in tense sequence (line 12); the words "of the" are omitted in line 7; "readily" is misspelled (line 10).

COMPARISON: While more dramatic than No. 4, the theme is properly placed lower on account of the large number of mechanical errors and the drooping narrative interest.

No. 6. "F" Grade Composition. Value, 46.9%

LIFE IN A CABIN

In a woods our cabin is which is made of logs. In side are two rooms furnished with rough hand made furniture. On the wall of the den hung skins and many pictures.

We had to have something to eat so we had to find a river where we could fish. We got enough fish and soon they were over the fire frying.

Next day an Indian came with some meat. We gave him a few copper; had he was real pleased.

"Jingle, jingle," was the noise out side as the horse galloped. It was couden Joe.

"Hurrah! now for some fun," I cried. "Come tobogganing? See that hill over there well its great tobogganing."

"Come in," said Joe, "till I get my moccasins?"

What fun we had many tumbles we got. Just as we were going home we saw a deer laying in the snow. We crept up to him but he did not move. Than we put him on the toboggan and took him home. He was cold but we gave him some warm milk and he tryed to get up. But he could not.

"Poor thing he must be hurt," said Joe. "His leg is broke don't you see." Then we bathed his leg and bound it. Soon he was able to stand on his legs and became a house pet.

"Oh, dear its snowing," said Joe, "Lets not go out as my snowshoes are not here."

MERITS: The merits of this theme are: (1) an attempt to make an introductory paragraph; (2) the introduction of conversation; (3) the use of inter-

rogative and exclamatory sentences; (4) the simple and natural language; (5) the orderly sequence of points in the story.

DEFECTS: Though well begun, after the first paragraph this theme is simply a series of disconnected events and apparently unrelated statements. (1) Punctuation is faulty; (2) sentences are badly constructed; (3) the meaning in several places is not clear; (4) there are many mechanical errors, such as "than" for "then"; "broke" for "broken"; "laying" for "lying"; "had" for "and"; (5) the apostrophe is omitted in contractions; and (6) the tense changes abruptly in the opening paragraph.

COMPARISON: This theme is inferior to No. 5 in sentence structure, in connected arrangement of material, and in mechanical accuracy.

Scores for the Harvard-Newton Scales. There are no standard scores available as yet, but it may be of interest to quote the scores for the tests made in the schools of Port Townsend, Washington.

Grade	5	6	7	8	9	10	11	12
Port Townsend Scores	46	46	53	58	58	63	70	73

CHAPTER X

THE MEASUREMENT OF ABILITY IN DRAWING

The Thorndike Drawing Scale. A scale for measuring ability in drawing has been prepared by Thorndike on the same general principles as his scale for handwriting. It is composed of a series of fourteen drawings ranging in merit from zero to 17. The successive steps of increase in merit are irregular, but the value of each drawing is accurately determined from the judgment of about 400 artists, teachers of drawing, and experts in education.

The scale is used for rating the merit of a child's drawing in the same manner as the handwriting scale is used for measuring samples of writing. The value of a drawing is indicated in terms of the step on the scale to which it is most like in quality.

The chief difficulty in using the scale is the fact that it does not contain specimens of the various types of drawings made in school. The scale ought to be extended by adding samples of the proper degrees of merit for each of the most common classes of objects drawn in school, as, for example, animals, human beings, leaves, landscapes, etc. But in spite of this shortcoming, the scale is useful, and the ratings of drawings can be made more accurately with the scale than without the scale.

Directions for Administering and Scoring the Test. Materials: White drawing paper, 6 X 9, black drawing pencil or crayon.

General data: Have the pupils write on the back of the sheet the name, grade, school, city, and date.

Subject: A picture or scene to illustrate the following stanza:

Under a spreading chestnut tree
The village smithy stands;
The smith, a mighty man is he,
With large and sinewy hands;
And the muscles of his brawny arms
Are strong as iron bands.

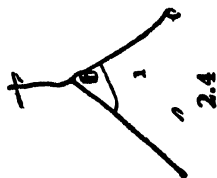
(Some other subject of comparable character may be used if it seems desirable.)

A Scale for the Merit of Drawings by Pupils 8 to 15 Years Old

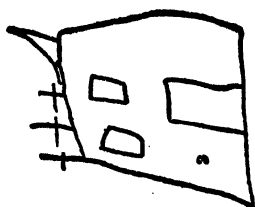
The numbers give the merit of the drawing as judged by 400 artists, teachers of drawing and men expert in education in general.



0



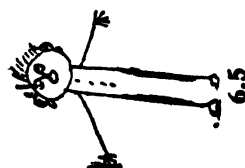
2.4



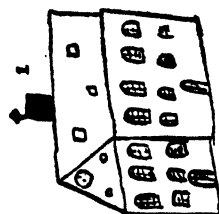
3.9



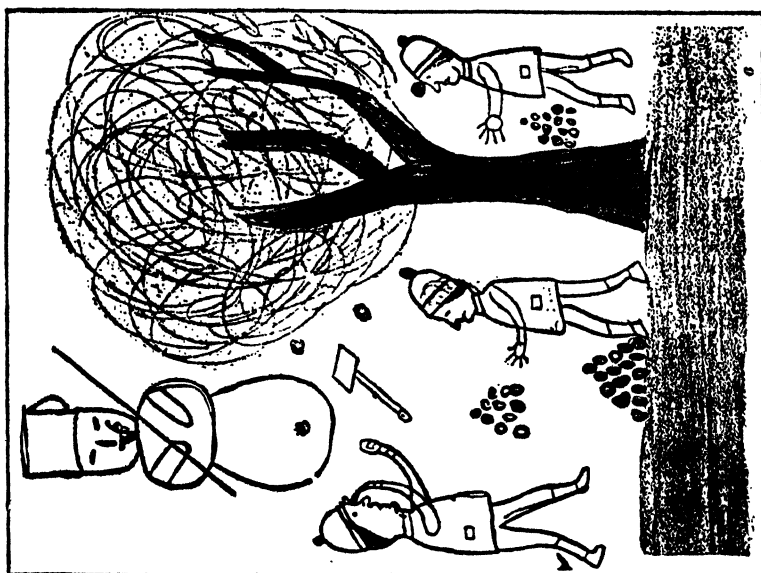
5.7



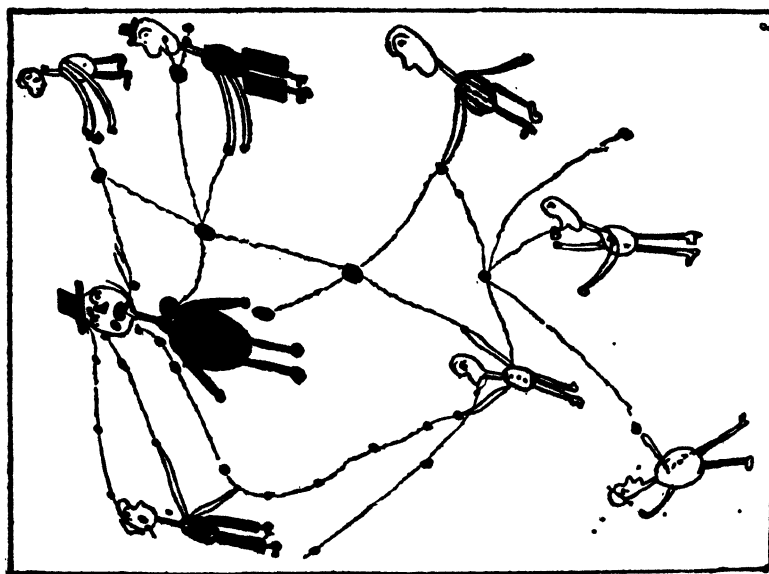
6.5



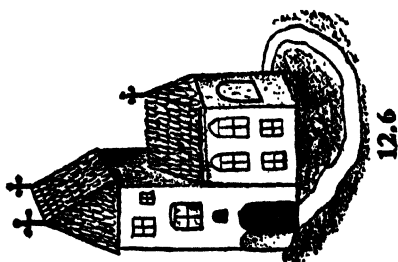
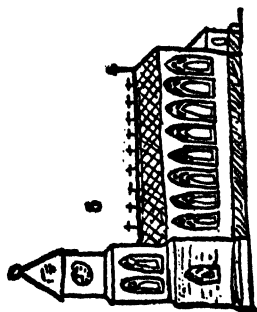
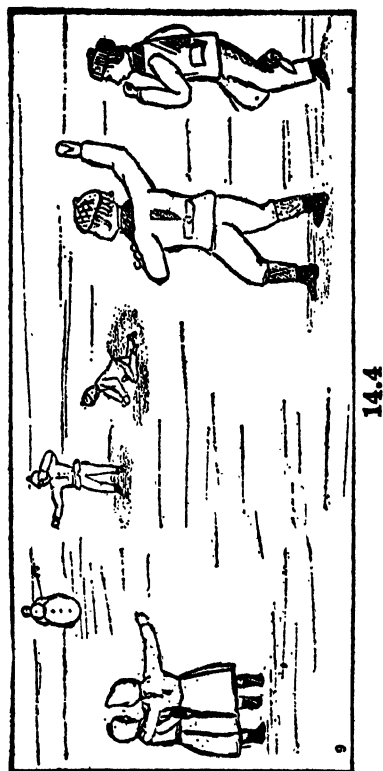
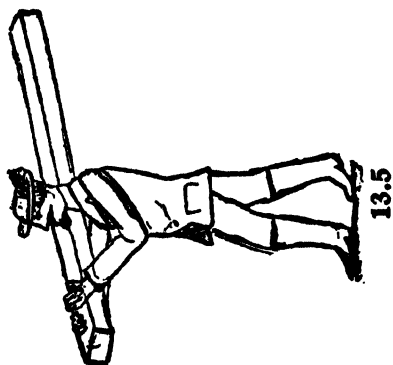
7.8

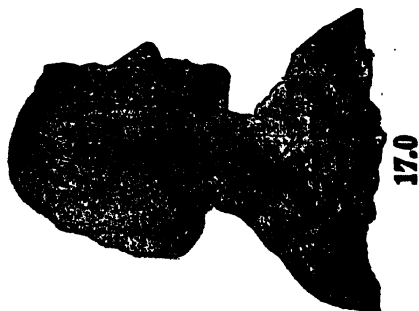


10.5



8.6





17.0



16.0

Time: Ten minutes, exclusive of all directions, preliminary questions, and the recording of general data. No suggestions or help should be given.

The drawings are then scored by the Thorndike scale. The results of a class should be tabulated to show the name of each pupil together with his score, and the average score for the entire class.

General standards of attainment for the various years have not been obtained as yet. Childs¹ employed the scale for measuring drawings of 2177 pupils in two school systems in Indiana and found the following median scores, in which the results for A and B sections of each grade are combined:

Grade	1	2	3	4	5	6	7	8
Score	5.8	6.7	7.8	8.0	8.3	9.1	9.0	9.1

The Rugg Lettering Scale. A scale for measuring free-hand lettering has been constructed by H. O. Rugg. It consists of graded specimens of lettering ranging in value from 30 per cent to 100 per cent. The specimens in the scale were selected from a large number of letterings made by a class in drawing in the college of engineering in the University of Illinois. The value of the various samples was determined primarily on the basis of the uniformity of the letters in respect to heights of letters, spaces between the letters and between the words, stems and ovals. The percentage of value assigned to a sample was determined by the number of defects in these four elements in the specimen. The exact method is described in detail by Mr. Rugg in the *Journal of Educational Psychology*, VI, 1915, 25-42.

¹ Childs, H. G., *Journal of Educational Psychology*, VI, 1915, 391-408.

A SCALE FOR MEASURING FREE-HAND LETTERING

FOR TECHNICAL COLLEGES AND SECONDARY SCHOOLS

HAROLD OSBWAY RUGG, C.E.

Efficiency in Lettering—Practice Daily Letters Most Frequently Used

Material Finished Cast Steel	Section Gear Parts Keyways	Shaft Bearing
Required Name Number View	Drill Holes Mast Studs Cover	Bronze Pipes
Dimension All Detail Drawings	Taper Joint Lock Nuts Mixer	1234567890

100

Material Finished Cast Steel	Section Gear Parts Keyways	Shaft Bearing
Required Name Number View	Drill Holes Mast Studs Cover	Bronze Pipes
Dimension All Detail Drawings	Taper Joint Lock Nuts Mixer	1234567890

80

169

Material Finished Cast Steel	Section Gear Parts Keyways	Shaft Bearing
Required Name Number View	Drill Holes Mast Studs Cover	Bronze Pipes
Dimension All Detail Drawings	Taper Joint Lock Nuts Mixer	1234567890

80

Material Finished Cast Steel	Section Gear Parts Keyways	Shaft Bearing
Required Name Number View	Drill Holes Mast Studs Cover	Bronze Pipes
Dimension All Detail Drawings	Taper Joint Lock Nuts Mixer	1234567890

70

A SCALE FOR MEASURING FREE-HAND LETTERING — Continued

Material Finished Cast Steel	Section Gear Parts Keyways	Shaft Bearing
Required Name Number View	Drill Holes Mast Studs Cover	Bronze Pipes
Dimension All Detail Drawings	Taper Joint Lock Nuts Mixer	1234567890

Material Finished Cast Steel	Section Gear Parts Keyways	Shaft Bearing
Required Name Number View	Drill Holes Mast Studs Cover	Bronze Pipes
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CHAPTER XI

THE MEASUREMENT OF ABILITY IN LATIN

Two types of tests for measuring ability in Latin have been prepared. The one is designed to measure the size of a pupil's vocabulary, and the other is designed to measure his ability to read and translate Latin sentences.¹

Latin Vocabulary Test. This test is composed of two sets of 100 words each. It is given according to the directions at the top of the sheet. The results are scored by ascertaining the number of words designated correctly in each list. The average of the two is the score.

LATIN VOCABULARY TEST I

Name *School* *Years Latin* *Date*

After each Latin word that you know, write the number of its English equivalent.

LATIN WORDS

- | | | |
|-------------------|--------------------|---------------------|
| 1. accusabilis | 19. commistim | 37. ferratilis |
| 2. admirabiliter | 20. concienens | 38. floralia |
| 3. aereus | 21. congregabilis | 39. frequentamentum |
| 4. alatus | 22. constructio | 40. galba |
| 5. alatucius | 23. contrusus | 41. grabatulus |
| 6. anhelatio | 24. cremabilis | 42. hapalopis |
| 7. apparatus | 25. cupula | 43. homocidalis |
| 8. argutatio | 26. deciduus | 44. ignave |
| 9. assignatio | 27. delocatio | 45. imperatrix |
| 10. auctoro | 28. desterno | 46. incestum |
| 11. balatro | 29. diligens | 47. inemptus |
| 12. bisolis | 30. diutius | 48. inops |
| 13. caducarius | 31. dupliciter | 49. interemptibilis |
| 14. canon | 32. elumbis | 50. iracunde |
| 15. cata | 33. escalis | 51. justificator |
| 16. certatim | 34. excubicularius | 52. latipēs |
| 17. circummunitio | 35. exquisitum | 53. libidinitas |
| 18. coercitio | 36. faenens | 54. libicilis |

¹ Copies of these tests may be obtained in desired quantities from the author.

55. maxime	71. praefodio	87. speres
56. matronalis	72. prehendo	88. stinguo
57. metaxa	73. profuse	89. suboleo
58. molasso-spondeus	74. provenio	90. sum
59. musso	75. quadrigalis	91. suspense
60. nemorosus	76. quotiensque	92. tangibilis
61. noviter	77. redhalo	93. terra
62. obruo	78. reloquus	94. torquis
63. officio	79. resonus	95. trimetros
64. orneus	80. rorulentus	96. tusculum
65. parabilis	81. salmo	97. ut
66. pavor	82. scato	98. vastities
67. perfacile	83. sedimen	99. vesonio
68. perturpis	84. sermocinanter	100. vitiparra
69. piscarius	85. silva	
70. parphyrites	86. solitas	

ENGLISH EQUIVALENTS

1. allotment	29. earnestly	57. of the mountain ash
2. angrily	30. very easily	58. murderous
3. answering back	31. ex-chamberlain	59. to mutter
4. as, how	32. to exhale	60. twisted necklace
5. babler	33. falling off	61. newly
6. to be	34. pertaining to fish	62. to oppose, hinder
7. blameworthy	35. flower-garden	63. to overwhelm
8. small bird	36. pertaining to food	64. panting
9. bright, clear	37. forest	65. pledge to bondsman
10. broadfooted	38. of a team of four	66. precious stone
11. to bubble forth	39. little frankincense	67. preparation
12. building	40. to grasp	68. easily procured
13. by	41. of hay	69. relating to property without a master
14. careful	42. helpless, without resource	70. to quench, extinguish
15. carefully	43. hesitatingly	71. re-echoing
16. combustible	44. hip-shot	72. repetition
17. to come forth	45. hopes	73. restraint
18. she who commands	46. how often soever	74. ruin, destruction
19. made of copper	47. investing a town	75. rule
20. little couch	48. to be insane, rave	76. a rustling
21. crowded together	49. ironed	77. salmon
22. desire	50. jointly	78. settlings
23. that can be destroyed	51. one who justifies	79. very shameful, scandalous
24. dewy	52. land, ground	80. raw silk
25. in discourse or con- versation	53. lavishly, extravagant	81. singing, harmonizing
26. dislocation	54. pertaining to light	82. sluggishly
27. doubly	55. loneliness	83. to smell
28. to dig before	56. longer	

- | | | |
|-------------------------|-----------------------------|-----------------------|
| 84. social | 90. two-footed | 96. winged |
| 85. spice | 91. unbought | 97. womanly, matronly |
| 86. having three meters | 92. unchastity | 98. wonderfully |
| 87. that may be touched | 93. to uncover | 99. woody |
| 88. trembling | 94. metrical verse | 100. small worm |
| 89. little tub | 95. very, in highest degree | |

LATIN VOCABULARY TEST II

After each Latin word that you know, write the number of its English equivalent.

LATIN WORDS

- | | | |
|---------------------|-------------------|-------------------|
| 1. acerbitudo | 35. execrabiliter | 69. pistriger |
| 2. admixitio | 36. falla | 70. portabilis |
| 3. aesalon | 37. fertilitas | 71. praegravidus |
| 4. album | 38. florosus | 72. prensatio |
| 5. amasco | 39. fetus | 73. progressio |
| 6. animabilis | 40. gallicarius | 74. provincia |
| 7. appello | 41. gradalis | 75. quadrula |
| 8. ariena | 42. harpastum | 76. racemus |
| 9. assimilatus | 43. honeste | 77. redimiculum |
| 10. audaciter | 44. ignispicum | 78. remergo |
| 11. balo | 45. impermeabilis | 79. respiraculum |
| 12. blandio | 46. inciduus | 80. rosula |
| 13. caeculto | 47. inersitudo | 81. salutaris |
| 14. cantharus | 48. inquiete | 82. scena |
| 15. certo | 49. interitio | 83. sedulo |
| 16. circumscriptor | 50. irraucesco | 84. serpula |
| 17. cognatus | 51. juveniliter | 85. similitas |
| 18. commodator | 52. latratorius | 86. sollertia |
| 19. concise | 53. libralis | 87. speusticus |
| 20. congruenter | 54. lucrio | 88. stips |
| 21. consuetus | 55. magnus | 89. conscriptus |
| 22. contunsum | 56. matus | 90. summersio |
| 23. crepus | 57. metoecus | 91. suspiciose |
| 24. cataractica | 58. monemeron | 92. tantus |
| 25. curabilis | 59. muto | 93. terrestris |
| 26. declamatiuncula | 60. nepotalis | 94. torus |
| 27. demensio | 61. noxa | 95. triplicabilis |
| 28. desub | 62. obscurus | 96. tutor |
| 29. diluvialis | 63. offuscatio | 97. utcumque |
| 30. diversorium | 64. orozeum | 98. vatius |
| 31. durus | 65. paradoxus | 99. vester |
| 32. emax | 66. pecorarius | 100. vituperatio |
| 33. eta | 67. perfigo | |
| 34. excusatiuncula | 68. pervenor | |

ENGLISH EQUIVALENTS

1. accursedly	36. a forester	69. not felled, uncut
2. accustomed	37. fruitfulness	70. not traversable
3. advancement	38. full of flowers	71. to pierce through
4. aerial	39. one fond of gain	72. a planet
5. agreeably	40. as great	73. pertaining to a
6. banana	41. gift	pound
7. bent outwards	42. stalk or cluster of	74. a rattling
8. blame	grapes	75. a little recitation
9. blow	43. great, large	76. reliance, confidence
10. to be blind	44. hard	77. to request
11. boldly	45. harm	78. restlessly
12. band, necklace	46. hastily	79. a little rose
13. briefly	47. hand-ball	80. sharpness
14. bruise	48. hawk	81. step by step, grad-
15. breathing	49. very heavy	ually
16. busily, carefully	50. to become hoarse	82. stranger
17. eager to buy	51. honorably	83. a little snake
18. to caress	52. howsoever	84. signed
19. that can be carried	53. inactivity	85. sinking, drowning
20. certainly	54. to hunt through	86. skill, shrewdness
21. dark	55. kindred, related	87. a Gallic shoemaker
22. a darkening	56. a knot, bulge	88. spice
23. defrauder	57. a lender	89. stage of theater
24. destruction	58. letter of Greek alpha-	90. a soliciting
25. to dip in again	bet	91. a little square
26. divination by fire	59. like, similar	92. to talk foolishly
27. small drinking vessel	60. likeness	93. territory
28. drunk, intoxicated	61. lodging place	94. threefold
29. of a deluge	62. to begin to love	95. a trick
30. of the earth	63. marvellous, strange	96. to watch, guard
31. extravagant	64. a measuring	97. whale-bearing
32. trifling excuse	65. a mingling	98. whiteness
33. eye-salve	66. mistrustingly	99. your
34. public farmer	67. to move	100. youthfully
35. that is to be feared	68. noisy	

These words were selected by the same method as the words used in the English vocabulary test. The first word on every 20th page of Harper's Latin Dictionary was chosen. Every 20th page was selected because that gave 100 words scattered at uniform intervals throughout the entire vocabulary. List I was made up by taking the first word from pages 20, 40, 60, etc. List II was made up by taking the first word from pages 21, 41, 61, etc.

This method of selection has three distinct advantages. First,

it gives a representative and uniform sampling of the entire Latin vocabulary. Second, the score obtained has a definite significance in the sense that it indicates the percentage of words of the entire Latin vocabulary that a person knows. If a pupil knows 25 words of each list, it means that he knows 25 per cent of the entire vocabulary. Third, any number of additional lists that may be desired can be made up by following the same plan of selection. It has been found in connection with the English vocabulary test and the spelling test that this method of selection yields lists which do not differ from each other in difficulty on the average by more than 2.5 per cent, and that an average obtained from two lists gives a very reliable score.

The method of matching the English equivalents with the Latin words is used in this test in preference to having the words defined or having them used in sentences because it makes the scoring absolutely objective. By means of a key, any one who may not know a word of Latin can score the results. All he needs to know is the correct number for each Latin word. Each word is designated either correctly or incorrectly.

Latin Reading Test. This test is composed of a series of sentences arranged approximately in the order of difficulty. These sentences were selected from the readings usually covered in high schools, namely, first year Latin books, Cæsar, Cicero and Virgil. The test is now being standardized and will, in its final form, have the sentences arranged in uniform steps of known difficulty. A pupil's score will then be the most difficult step or set of sentences passed. In the meantime the test will be useful as it stands and may be scored simply by the number of sentences translated correctly.

LATIN READING TEST

Translate the following sentences. Write your translation under each sentence.

1. Amo.
2. Sunt.
3. Homo est magnus.
4. Puella est parva.
5. Docet.
6. Laudabam.
7. Rex signum audivit.

8. Non vident.
9. Silvae explorabantur.
10. Dominus servum liberat.
11. In magna silva sunt copiae.
12. Britannia est magna insula.
13. Multi Romani in oppido pugnat.
14. Nationes et civitates Galliae timore belli perterritae sunt.
15. Mihi oppidum est expugnandum.
16. Nemo est qui haec non faciat.
17. Cives urbem vallo munient et cum virtute se defendent.
18. Nolite hos milites de monte deducere.
19. Vidit milites quos imperator misisset fortiter pugnare.
20. In media urbe ara maxima erat.
21. Num pedes referent cives Romani?
22. Apud Helvetios longe nobilissimus fuit et ditissimus Orgetorix.
23. Planities erat magna et in ea tumulus terrenus satis grandis.
24. Locus erat castrorum editus et paulatim ab imo acclivis circiter passus mille.
25. Ad mortem te, Catalina, duci iussu consulis iam pridem oportebat.
26. Video, patres conscripti, in me omnium vestrum ora atque oculos esse conversos.
27. Nunc, ante quam ad sententiam redeo, de me pauca dicam.
28. Neque vero sine ratione certa causa Milonis semper a senatu probata est.
29. Haec ubi dicta, cavum conversa cuspide montem impulit in latus.
30. Rex erat Aeneas nobis, quo iustior alter, nec pietate fuit, nec bello maior et armis.

Scores. The following tentative scores are based on three Latin classes :

Years of Latin	I	2	3	4
Vocabulary Score	18	24	30	36
Sentence Score	13	16	19	22

CHAPTER XII

THE MEASUREMENT OF ABILITY IN GERMAN

THE tests for measuring ability in German have been prepared on the same general principles as those for Latin. One test measures the size of a pupil's vocabulary, and the other measures a pupil's ability to read German.¹

German Vocabulary Test. The test is composed of two sets of 100 words each. The results are scored by ascertaining the number of words numbered correctly in each list. The average of the two lists is the score.

These words were selected by taking the first word on every 23d page of the large Muret-Sanders German-English dictionary. Every 23d page was chosen because that gave 100 words scattered at uniform distances through the entire vocabulary. List I was obtained by taking the first word on pages 23, 46, 69, etc. List II was obtained by taking the first word on pages 24, 47, 70, etc.

The critical points concerning the validity, reliability, advantages and limitations of the test are the same as those discussed in connection with the Latin test and need not be repeated here.

GERMAN VOCABULARY TEST I

After each German word that you know, write the number of its English equivalent.

GERMAN WORDS

- | | | |
|----------------------|-----------------|-------------------|
| 1. abspielen | 10. austernhaft | 19. coulant |
| 2. Abtr ger | 11. Barschheit | 20. dazu-gehoerig |
| 3. alle | 12. begreiflich | 21. Ding |
| 4. Angeber | 13. beneiden | 22. Drohnis |
| 5. anschliesslich | 14. bestbekannt | 23. durchschlagen |
| 6. arsenikalisch | 15. bildern | 24. Eifer |
| 7. Aufmarschkommando | 16. Blutezeit | 25. einleiern |
| 8. ausaasen | 17. breit | 26. einzaoken |
| 9. ausleuen | 18. buegeln | 27. entgegenen |

¹ Copies of these tests may be obtained in desired quantities from the author.

23. erfreveln	53. Knall	77. Schmuck
29. ertreten	54. Kopf	78. Schuld
30. faelteln	55. Kritteln	79. Sechs
31. Ferkelchen	56. laienhaft	80. Sieber
32. fleischen	57. lebendig	81. Sparer
33. fragenswert	58. Leute	82. Spund
34. funkelneu	59. losen	83. Stelle
35. Gebiss	60. Mandel	84. Strategem
36. Gekreisch	61. meidingern	85. suppicht
37. Gerste	62. Mitgeborene	86. Teufel
38. Gewalt	63. Mund	87. Transch
39. gleichbar	64. Nacht	88. tuerkel
40. Grausamkeit	65. Netz	89. Ulk
41. Guss	66. Oblatorium	90. ungepflegt
42. Haelschen	67. panzern	91. Unverfrorenheit
43. Haspel	68. Pferd	92. Vereiniger
44. heiss	69. Portraet	93. vermoeglich
45. herum	70. putzen	94. verthan
46. hinaus	71. Rebbes	95. voll
47. Hoheit	72. Repracsantanten-	96. votieren
48. Hundertstel	schafft	97. Wasser
49. insgeheim	73. rot	98. weltlich
50. jungfernhaf	74. Samen	99. Wind
51. Kardinal-kaefer	75. Schatz	100. Wuerfelei
52. kieselhaft	76. Schlaf	

ENGLISH EQUIVALENTS

1. all, any	19. business circular	39. gain, profit
2. annexed, enclosed	20. bung, spigot	40. hot
3. like arsenic	21. one who carries off	41. highness
4. appertaining	22. comprehensible	42. hundredth
5. to answer	23. to obtain by crime	43. head
6. worth asking about	24. comparable	44. horse
7. almond	25. cruelty	45. to iron, to smooth
8. to tell anecdotes	26. casting, pouring out	46. cool impudence
9. to arm with coat of mail	27. to clean	47. to lull to sleep
10. adornment	28. debt	48. lay, unprofessional
11. able to do	29. devil	49. living, alive
12. bluntness, harshness	30. damaged	50. to cast lots
13. broad	31. done for, finished	51. a body of representatives
14. to beat, punish	32. to envy	52. line of march
15. barley	33. flowering season	53. maidenly
16. a beetle	34. fair, easy	54. mouth
17. a bang, noise	35. to cut flesh	55. to notch, indent
18. those of contemporary birth	36. fooling, fun	56. brand new
	37. full	57. little neck
	38. faultfinding	

- | | | |
|--|-----------------------|--------------------------|
| 58. night | 72. round about | 87. soup-like |
| 59. oysterlike | 73. red | 88. to trample to death |
| 60. net | 74. reproof, scolding | 89. treasury |
| 61. out there | 75. to scold | 90. set of teeth |
| 62. to turn the leaves of a picture-book | 76. one who states | 91. to unload |
| 63. little pig | 77. shrieking | 92. uncared-for |
| 64. power | 78. secretly | 93. uniter |
| 65. pebbly | 79. seed | 94. to vote |
| 66. people | 80. sleep | 95. to get by whispering |
| 67. picture | 81. six | 96. wind |
| 68. position | 82. sifter | 97. best known |
| 69. playing at dice | 83. strategy | 98. water |
| 70. to ruffle, plait | 84. one who is saving | 99. worldly |
| 71. reel, winder | 85. thing | 100. zeal |
| | 86. threatening | |

GERMAN VOCABULARY TEST II

After each German word that you know, write the number of its English equivalent.

GERMAN WORDS

- | | | |
|--------------------|-----------------------|-------------------|
| 1. abmalen | 26. Einzieher | 51. Karnies |
| 2. abtrippeln | 27. enthaltsam | 52. Kind |
| 3. Alleinheit | 28. ergarnen | 53. Knauel |
| 4. Angel | 29. erwecken | 54. Koepfchen |
| 5. ausschreien | 30. famielenhaft | 55. Kroeneleisen |
| 6. Artillerist | 31. Ferse | 56. Lamperie |
| 7. aufnehmenswert | 32. Fleiss | 57. Leben |
| 8. ausbachen | 33. franko | 58. Libretto |
| 9. Ausmach-hechel | 34. Furche | 59. Losung |
| 10. austreibbar | 35. Gebraeuchlichkeit | 60. mangeln |
| 11. Baseitaet | 36. gelb | 61. meinewillen |
| 12. Beguenstiger | 37. Geruest | 62. Mitleidenhaft |
| 13. benzen | 38. Gewaesser | 63. munizipal |
| 14. Bestaetter | 39. Gleichgewicht | 64. nachtanzen |
| 15. Billet | 40. greifen | 65. neu |
| 16. Bobine | 41. gut | 66. Obstand |
| 17. breitlich | 42. halten | 67. Papier |
| 18. buehnenhaft | 43. Hatschier | 68. pflanzen |
| 19. Croquist | 44. heitzbar | 69. Possekel |
| 20. decimal | 45. herumpfuschen | 70. Quader |
| 21. diophantisch | 46. hinaustragen | 71. Rechnung |
| 22. Druck | 47. Hoehleisen | 72. Resinit |
| 23. durchschnitten | 48. hundsigt | 73. Rotté |
| 24. eigen | 49. Instmann | 74. sammeln |
| 25. einullen | 50. Juror | 75. schaubar |

76. Schlag	85. Suverbetel	94. Vertraeglichkeit
77. Schnabel	86. That	95. Vollbringer
78. schulen	87. Trassat	96. wach
79. Sec	88. Turnei	97. waessern
80. Sieger	89. umbaut	98. Wendung
81. spaet	90. ungesetzmaesig	99. Winder
82. Staat	91. Unversaemtheit	100. Wuermchen
83. stellen	92. verfahren	
84. streben	93. Verneinung	

ENGLISH EQUIVALENTS

1. to awaken	36. good	70. resistance
2. awake	37. to gather	71. spool
3. archer	38. hinge, pivot	72. stage-worthy
4. account	39. to hoot, halloo	73. sketcher
5. achiever	40. heel	74. for my sake
6. to bathe, foment	41. to hold	75. sympathy
7. basicity	42. that may be heated	76. a stroke, blow
8. broadish	43. hollowing iron	77. state
9. balance, equilibrium	44. little head	78. to set, put
10. ball of thread	45. roughing hammer	79. to strive
11. book of words	46. large hammer	80. sociability
12. broadstone	47. to importune	81. to trip off
13. beak, bill	48. indeterminate (problem)	82. ticket
14. cut through	49. industriousness	83. temperate in drink
15. customariness	50. impudence	84. to tinker at
16. to carry out	51. juryman	85. to teach, go to school
17. cornice	52. loneliness	86. tournament
18. child	53. to lull to sleep	87. surrounded by trees
19. a crowd	54. lodger	88. a turning, a change
20. broad chisel	55. life	89. twister
21. dispatcher, conveyor	56. late	90. urban
22. fraction, decimal	57. one who moves in	91. unlawful
23. dog-like	58. new	92. visible
24. deliverance	59. negation	93. visitor
25. to dance after	60. own, one's own	94. worthy of being admitted
26. deed	61. sea	95. waters
27. drawee	62. to paint, to copy	96. wainscoting
28. expellable	63. protector, patron	97. to be in want
29. to ensnare	64. pressure	98. to water
30. finishing-heckle	65. postpaid	99. little worm
31. familiar	66. paper	100. yellow
32. furrow	67. to plant	
33. frame, scaffold	68. pitchstone	
34. a gunner	69. to proceed	
35. to grab, clutch		

German Reading Test. This test, like the Latin test, is composed of a series of sentences arranged roughly in the order of increasing difficulty. The sentences were selected from the first year texts and from the authors usually covered in four years of German. This test will be standardized by ascertaining the precise value of each sentence. The sentences will then be arranged in the order of definite steps. For the present the test will be useful as it stands and may be scored simply by the number of sentences translated correctly.

GERMAN READING TEST

Translate the following sentences. Write your translation under each sentence.

1. Ja.
2. Nein.
3. Ich bin.
4. Er hat.
5. Wir waren.
6. Sie sind gegangen.
7. Der Mann ist gross.
8. Der Knabe ist klein.
9. Mein Bruder hat den Ring verloren.
10. Ich gebe dir ein Glass Wasser.
11. Wo steht der Stuhl?
12. Es war ein kalter Winter.
13. Die Uhr war ein sehr schoenes Geschenk.
14. Es ist schwer, gegen den Strom zu schwimmen.
15. Wir zeigten ihnen alles, was in unserer Stadt zu sehen ist.
16. Das Buch ist interessant.
17. Ich bin nun zwei Tage in der Stadt.
18. Tief unten zu unseren Fuessen lag wie im banger Traume die Stadt Freiburg mit ihren zerstrauten, matt schimmernden Lichtern.
19. "Gut gesagt" hiess es von allen Seiten.
20. Jetzt erhob sich Friedrich bruellend wie ein angeschossener Loewe.
21. Diese Dame fuehrte seit fast einem halben Jahrhundert auf ihrem Gute, dem Vermachtnisse ihres verstorbenen Gatten, ein weises regiment.
22. Wer sind die beiden Figuren, die eben da eintreten, wo ich hereingekommen bin?
23. Ja, mein Kind! Hoere deinen Vater.
24. Meine Pferde stehen schon eine Stunde vor dem Hause, und ich bin nicht des Wartens wegen da.
25. Und nun sass er da an dem Fenster der Weinstube und blickte unverwandt auf den Platz hinaus, ueber dessen sandige Flaechen der Wind, Staub aufwirbelnd, dahinstrich.

26. "Das schadet gar nichts," grunzte der alte Oberst.
 27. Es wurde beschlossen, die Geschichte gleich jetzt an Ort und Stelle abzumachen.
 28. Und da lœuft man hinab im heissen Staube des Mittags.
 29. Freundlich begann sogleich die ungeduldige Hausfrau :
 "Saget uns, was ihr gesehn ; denn das begehrt' ich zu wissen."
 30. Also gingen die zwei entgegen der sinkenden Sonne,
 Die in Wolken sich tief, gewitterdrohend verhuelle.

Standards of Attainment. The following standards have been derived from a limited number of tests and are subject to future revision.

Years of German	1	2	3	4	5	6
Vocabulary Score	20	27	34	41	48	55
Sentence Score	16	18	20	22	24	26

CHAPTER XIII

THE MEASUREMENT OF ABILITY IN FRENCH

THE tests for measuring ability in French¹ are entirely similar in principle to the tests in Latin and German.

French Vocabulary Test. The test is composed of two sets of 100 words each. The results are scored by ascertaining the number of words designated correctly in each list. The average of the two lists is the score.

These words were selected by taking the first word on every sixth or seventh page alternately in Spiers and Surenné's large French-English dictionary. This gave 100 words scattered at regular intervals through the entire vocabulary. List I was obtained by taking the first word on pages 6, 13, 19, 26, etc. List II was obtained by taking the first word on pages 7, 14, 20, 27, etc.

FRENCH VOCABULARY TEST I

After each French word that you know, write the number of its English equivalent.

FRENCH WORDS

- | | | |
|---------------|---------------------|-------------------|
| 1. accointer | 17. choquer | 33. echalas |
| 2. affecte | 18. cocuage | 34. effeuillaison |
| 3. alcool | 19. commissionaire | 35. embrunir |
| 4. analyse | 20. condylien | 36. enfilade |
| 5. appellatif | 21. constitutionel | 37. entraver |
| 6. arriere | 22. cophrophage | 38. epuiser |
| 7. attaquer | 23. coulant | 39. etarquer |
| 8. avoir | 24. crasse | 40. excrer |
| 9. bas | 25. cumul | 41. faible |
| 10. bijon | 26. deceindre | 42. fermer |
| 11. botanique | 27. defroquer | 43. flamine |
| 12. briquet | 28. denominer | 44. fortifiant |
| 13. caique | 29. desastreusement | 45. friguet |
| 14. carriole | 30. deverguer | 46. garder |
| 15. cerf | 31. disjonctif | 47. glanduliferre |
| 16. chasser | 32. dorloter | 48. grenaille |

¹ Copies of these tests may be obtained in desired quantities from the author.

49. halo	67. opposite	85. romane
50. honnir	68. pairement	86. saintement
51. ignorant	69. parlerie	87. sbire
52. incele	70. payer	88. seran
53. inflammatoire	71. periode	89. sodium
54. interregne	72. pierrier	90. sourdement
55. jeter	73. plethore	91. submersion
56. laine	74. porte	92. sympathique
57. lester	75. prebende	93. temperant
58. lointain	76. prise	94. tireligne
59. main-d'oeuvre	77. protestant	95. tournis
60. marcher	78. quoailler	96. trichisme
61. mecontentement	79. rapeller	97. usage
62. mieux	80. recousse	98. verdict
63. monopoleur	81. regreffer	99. vingtieme
64. murir	82. renicur	100. wolfram
65. nid	83. requerir	
66. occasionel	84. reveil	

ENGLISH EQUIVALENTS

1. affected	28. discontent	54. to name
2. alcohol	29. door	55. to nurse
3. analysis	30. drawing-pen	56. nest
4. appellative	31. to exhaust, waste	57. to be offensive
5. to attack	32. to execrate	58. occasional
6. accumulation	33. evenly	59. opposite
7. awakening, alarm	34. exhuberance of blood	60. prop
8. Roman archer	35. flowing	61. a Roman priest
9. bottom	36. to fetter	62. to pay
10. botany	37. capillary fracture	63. period
11. to beat to arms	38. glandular	64. protestant
12. of certain beetles	39. minute grains	65. rear, back
13. to beware	40. to graft again	66. remote
14. to ballast	41. to have	67. to ripen
15. best	42. to hunt	68. revenue
16. tilted cart	43. to hoist sail	69. rescue
17. cuckoldom	44. halo	70. to request
18. commissioner	45. heckle	71. romanesque
19. constitutional	46. to get intimate	72. stripping off the leaves
20. chattering	47. ignorant	73. suite of rooms
21. taking, capture	48. inflammatory	74. to shut
22. deer	49. interregnum	75. sparrow
23. dirt	50. of a knuckle	76. swivel
24. disastrously	51. a launch	77. swearer
25. disjunctive	52. monopolist	78. saintly
26. to darken	53. without noise, secretly	79. sodium
27. to dishonor		

- | | | |
|----------------|-----------------------|------------------------|
| 80. submersion | 87. temperate person | 94. verdict |
| 81. sympathy | 88. twentieth | 95. to unbend (a sail) |
| 82. sturdy | 89. tungsten | 96. weak |
| 83. turpentine | 90. to ungird, loosen | 97. wool |
| 84. tinder-box | 91. to unfrock | 98. workmanship |
| 85. tonic | 92. unconcealed | 99. to walk |
| 86. to throw | 93. usage | 100. to wag the tail |

FRENCH VOCABULARY TEST II

After each French word that you know, write the number of its English equivalent.

FRENCH WORDS

- | | | |
|-------------------|---------------------|--------------------|
| 1. accoupler | 35. emmitoufler | 69. part |
| 2. affranchir | 36. engagé | 70. pectoral |
| 3. allaitement | 37. entepas | 71. perpetuer |
| 4. anecdote | 38. eremetique | 72. pincer |
| 5. appret | 39. etement | 73. plonger |
| 6. arteriole | 40. exigant | 74. porter |
| 7. attentivement | 41. faire | 75. predeterminant |
| 8. balauder | 42. feu | 76. problematique |
| 9. batelage | 43. flettrissure | 77. pruner |
| 10. bistortier | 44. foudoyer | 78. raccourcir |
| 11. boudinage | 45. frontispice | 79. rarissime |
| 12. broncher | 46. gastronome | 80. reculee |
| 13. calicot | 47. gloutonnement | 81. rejouissance |
| 14. caser | 48. grimeliner | 82. recruter |
| 15. chaucuniere | 49. harpagon | 83. resolutoire |
| 16. chaud | 50. hospice | 84. reverenciel |
| 17. cltrysocale | 51. imager | 85. rose |
| 18. coheriter | 52. incommunicable | 86. saligaud |
| 19. compagnonnage | 53. inhibition | 87. scientifique |
| 20. confiteur | 54. intriguer | 88. serrefile |
| 21. content | 55. joaillier | 89. soldat |
| 22. corde | 56. lamentation | 90. sous-sol |
| 23. coupable | 57. lever | 91. successivement |
| 24. crepi | 58. lormier | 92. table |
| 25. cyesiologie | 59. majestueusement | 93. tendance |
| 26. dechireur | 60. marital | 94. titrer |
| 27. degouter | 61. melancholie | 95. traductrice |
| 28. departement | 62. miner | 96. triste |
| 29. deseurayer | 63. moneteur | 97. vaccinateur |
| 30. devorant | 64. myope | 98. veron* |
| 31. disputer | 65. noircir | 99. viser* |
| 32. douxceux | 66. odorat | 100. wombat |
| 33. echelon | 67. ordinaire | |
| 34. egalite | 68. palmiste | |

ENGLISH EQUIVALENTS

- | | | |
|----------------------------|---------------------------|-----------------------|
| 1. anecdote | 35. hospital | 69. reverential |
| 2. small artery | 36. image-vender | 70. rose |
| 3. attentively | 37. incommunicable | 71. to stumble |
| 4. to aim at | 38. to scheme, intrigue | 72. slightly sweet |
| 5. boating | 39. jeweler | 73. to strike with |
| 6. to blacken | 40. to lounge | thunder |
| 7. breast-plate | 41. late (lately dead) | 74. saddler |
| 8. bearlike animal | 42. lamentation | 75. setter (of gems) |
| 9. calico | 43. miser | 76. short-sighted |
| 10. confession and prayer | 44. majestically | 77. smell |
| 11. content | 45. pertaining to husband | 78. share, part |
| 12. to contest, dispute | 46. melancholy | 79. to shorten |
| 13. to come up, rise | 47. to mine | 80. subsequent |
| 14. cabbage-tree | 48. moving back | 81. scientific |
| 15. to carry | 49. minnow | 82. sternmost |
| 16. to disgust | 50. nursing | 83. soldier |
| 17. distribution | 51. ordinary | 84. subsoil |
| 18. devouring | 52. preparation | 85. successively |
| 19. to do | 53. pestle | 86. sad |
| 20. dirty fellow | 54. to make a point | 87. a medical science |
| 21. equality | 55. pinch-beck, sham | 88. trade-union |
| 22. an epicure | 56. ambulating pace | 89. tearer, ripper |
| 23. to free | 57. prohibition | 90. tenant |
| 24. fading, withering | 58. to perpetuate | 91. troublesome |
| 25. frontispiece | 59. to pinch | 92. to take in |
| 26. guilty | 60. to plunge | 93. to unite |
| 27. greedily, gluttonously | 61. predominating | 94. to unskid |
| 28. to gamble pettily | 62. problematical | 95. table |
| 29. head | 63. plum-tree | 96. tendency |
| 30. one's home | 64. roving | 97. to title |
| 31. joint heir | 65. rough-coat, parget | 98. translatress |
| 32. heart-like | 66. round of a ladder | 99. vaccinator |
| 33. hermetical | 67. most rare | 100. to wrap up |
| 34. heading, topping | 68. rejoicing | |

French Reading Test. This test, like the Latin and German reading tests, is composed of a series of thirty sentences arranged roughly in the order of increasing difficulty. The sentences were selected from first-year texts and from the readings usually covered in schools. The test will be standardized by further experimentation and will be arranged in the form of a scale of steps of known value. For the present the test will be useful as it stands and can be scored by ascertaining the number of sentences translated correctly.

FRENCH READING TEST

Translate the following sentences. Write your translation under each sentence.

1. Oui.
2. J'ai.
3. Je suis.
4. Il est.
5. Vous êtes.
6. L'homme est riche.
7. L'enfant est jeune.
8. Le chapeau du garçon est neuf.
9. Nous avons des frères et des soeurs.
10. Jean Valjean n'était pas mort.
11. J'ai un marteau de fer.
12. Le livre appartient au professeur.
13. La fille de la femme est à l'école.
14. Non, monsieur, j'ai un mouchoir seulement.
15. Voulez-vous une serviette?
16. Votre ami a-t-il une maison dans notre rue?
17. Garçon, passez-moi du lait, je vous prie.
18. Le fermier a vendu quatre-vingts livres de beurre à l'épicier.
19. J'ai fermé les fenêtres d'école, et ouvert la porte de la chambre.
20. Si tu me rends mes livres, je te rendrai les tiens.
21. J'achète mon papier à lettre et mes enveloppes chez le marchand du coin.
22. Mes chères élèves, je désire que vous soyez toujours heureux.
23. Je ne crois pas que la richesse soit indispensable.
24. Notre mère veut que nous ne mangions jamais entre nos repas.
25. Il n'y a pas à dire, mon ami, vous avez eu tort de parler ainsi.
26. Je ne puis pas me repentir de tout ce que je fais pour vous.
27. Colomba, haletante, épuisée, était hors d'état de prononcer une parole.
28. Un matin, la foule qui le contemplait fut témoin d'un accident.
29. En ce moment, un mouvement se fit tout à côté du président.
30. Du reste, il était demeuré aussi simple que le premier jour.

Scores. The following tentative scores have been derived from five classes in French in three schools:

Years of French	I	2	3	4
Vocabulary Score	38	43	48	53
Sentence Score	18	20	22	24

CHAPTER XIV

THE MEASUREMENT OF ABILITY IN PHYSICS

THE test for measuring knowledge of physics was prepared on two general principles. In the first place, a study of textbooks was made to ascertain the common elements in them, and in the second place, the facts for the test were arranged in the form of mutilated text. The principle of the mutilated text seems to be sound and has been found useful in various types of psychological test work.

A careful comparison was made of five textbooks widely used in high schools for the purpose of ascertaining the facts, principles, and laws that are treated in several or all of the books.¹ It was found that 170 principles, facts or topics were treated in four of the five texts, and 102 of the 170 were treated in all five books. These 102 items are incorporated in the following seventy-five statements of the mutilated text. The test will be standardized by ascertaining the relative value of the various statements by determining their difficulty. For the present, however, the test will be useful as it stands and may be scored by determining the number of statements that a pupil completes correctly.

The test may be given in sections after each particular topic has been completed, or it may be given as a whole at the end of the course.

TEST FOR PHYSICS*

Mechanics

1. The.....is the absolute unit of force that, acting upon of mass will give to it an acceleration of per second per second.
2. The *erg* is the work done by a force of acting through a distance of

¹ Black and Davis, *Practical Physics for Secondary Schools* (1913). Carhart and Chute, *First Principles of Physics* (1912). Hoadley, *Essentials of Physics* (1913). Mann and Twiss, *Physics* (1910). Millikan and Gale, *A First Course in Physics* (1913).

* Copies of this test may be obtained in desired quantities from the author.

3. In the equation $s = at^2$, s means, a means, t means
4. The point of application of the resultant of all the parallel forces that make up the weight of a body is its
5. The law of means that no energy is created and none destroyed.
6. The smallest stress that will cause a permanent set in a body is called
7. The energy of an elevated body is an example of energy. The energy of a descending hammer is an example of energy.
8. If two forces are represented by two adjacent sides of a parallelogram, their resultant is represented by
9. If a stone, dropped from the top of a cliff, strikes the bottom in 5 seconds, the cliff is feet high.
10. If a man draws a ton of mortar up in buckets a distance of 10 feet, he does foot-pounds of work.
11. Any two bodies in the universe attract each other with a force which is proportional to the product of and proportional to
12. A boy pulls a loaded sled weighing 200 lb. up a hill which rises 1 ft. in 5 measured along the slope. Neglecting friction, he exerts pounds of force.
13. The mechanical advantage of any lever is the ratio of to
14. The tendency of a body to retain its condition of rest or motion is
15. The rate of change of momentum is proportional to and takes place in the direction in which
16. To every action there is reaction in direction.
17. The periods of pendulums of equal lengths swinging through short arcs are independent of and also independent of
18. The period of a pendulum is directly proportional to
19. A cord must pass times to and from a movable pulley in order that a 50 lb. weight may support a 200 lb. weight.
20. The absorption of ink by a blotter is an illustration of action.
21. Pressure exerted upon any part of an inclosed liquid is transmitted in all directions and acts with force on all surfaces and at right angles to them.
22. The pressure per square foot in a swimming tank filled with water to a depth of 10 ft. is pounds. The weight of a cubic foot of water is 62.4 lbs.
23. The ratio between the weight of a body and the weight of is its specific gravity.
24. The specific gravity of a wooden ball that floats two thirds under water is
25. The fact that liquids take a spherical form is an illustration of the phenomenon of

26. A barometer is an instrument for measuring
27. The temperature remaining the same, the volume of a given mass of gas varies
28. The pressure of the atmosphere at sea level is lb. per square inch.

How many weeks have you studied mechanics ?

Name Date

School City

Heat

29. A temperature of 50 degrees centigrade is the same as degrees Fahrenheit.
30. The point degrees below degrees centigrade is called absolute zero.
31. The quantity of heat required to raise of water through centigrade is called
32. The process by which heat is carried from hotter bodies to colder bodies by a moving fluid is called The process by which it is transferred through substances that are at rest is called
33. The coefficient of expansion is the ratio of the increase in volume to the original volume produced by
34. The number of work units that correspond to a heat unit is called
35. The intensity of radiant heat is inversely proportional to
36. The specific heat of a substance is the number of required to raise the temperature of through centigrade.

How many weeks have you studied heat ?

Name Date

School City

Sound

37. Two tuning forks whose frequencies are 435 and 440 respectively when sounded together will produce beats per second.
38. The tone produced when a string vibrates as a single loop is called Those produced when it vibrates in two or more loops are called
39. The frequency of vibration of a string varies inversely as
40. It also varies inversely as, when the length is constant.
41. It also varies inversely as, when the length and tension are constant.
42. Sound travels per second at 20° C.
43. The pitch of a tone depends upon

44. The quality of a tone depends upon .
 45. The loudness of a tone depends upon

How many weeks have you studied sound ?

Name Date ..

School City ..

Light

46. Two colors are complementary if they produce when they are mixed.
 47. If the angle of incidence is 45° the angle of reflection will be degrees.
 48. The ratio of the speed of light in to its speed in any medium is called the index of refraction.
 49. A photometer is an instrument for measuring
 50. A 4-candle-power light must be placed feet from a screen in order to give the same illumination as a 16-candle-power light 9 feet away.
 51. Light travels per second.
 52. A continuous spectrum composed of the colors from to is produced by passing light through a prism.
 53. The critical angle is that angle of incidence which will produce
 54. If the image of an object 10 feet away is 3 feet from the lens, the focal length of the lens is

How many weeks have you studied light ?

Name Date

School City

Magnetism and Electricity

55. Electromotive force is the difference in between
 56. A dynamo is a machine for
 57. An electric motor is a machine for
 58. The rotating part of a dynamo, consisting of the coil with its core, is called the
 59. A commutator is a device for
 60. A transformer is a device for
 61. An induction coil is composed of a coil containing turns of coarse wire and a coil containing turns of fine wire.
 62. The instrument for the comparison of currents by means of is called a galvanometer.
 63. If the galvanometer reads in terms of it is called an ammeter.

64. The is the unit of current which will deposit .001118 gram of in one second.
65. The is the unit of resistance of a column of mercury in cross section and 106.3 cm. long.
66. The resistance of a conductor is directly proportional to
67. It is also inversely proportional to
68. A volt is the E. M. F. which will cause a current of to flow through a resistance of
69. If the current through an incandescent lamp is 0.55 ampere and the potential difference between its terminals 110 volts, the resistance of the lamp is ohms.
70. The watt is the power required to keep a current of flowing under a drop of
71. Watts = amperes \times
72. At 10 cents per kilowatt hour it will cost to run a 220 volt motor for 10 hours, if the motor draws 25 amperes.
73. A Leyden jar is a common type of consisting of two conductors separated by
74. The resistance of 100 ft. of copper wire ($K=10.19$) No. 24 ($Diam.=0.2001$ in.) is ohms.
75. If a storage cell has an E. M. F. of 2 volts and furnishes a current of 5 amperes, its rate of expenditure of energy is watts.

How many weeks have you studied magnetism and electricity?

Name

School City

Scores. Since the test is in process of standardization, there are no established scores. The following scores were made by a class in a good high school which had spent fourteen weeks on mechanics. It will be noticed that the scores and the teacher's marks agree very closely. The half scores are due to the fact that certain of the statements may be half right, as, for example, Number 7.

Pupils	Scores	Teacher's Marks
1	24	E
2	23½	E
3	23	G+
4	22½	G+
5	21½	G+
6	20½	G+
7	15½	P+
8	14½	F+
9	14½	F
10	13½	F

Pupils	Scores	Teacher's Marks
11	13	F +
12	12	F -
13	11½	F -
14	11½	P
15	11	P +
16	11	P -
17	4	Fld.
Av.	15.8	

CHAPTER XV

THE USE OF STANDARD TESTS IN SCHOOL EXPERIMENTS

A GREAT deal of experimental work has been done in the psychology of individual differences and in the psychology of learning in general. But practically nothing has been done in the psychology of the learning of school subjects under school conditions. We have a very considerable body of facts about the learning of more or less artificial material such as syllables, words, poetry, prose and symbols of various sorts. We know something about the effect upon the rate of learning of such factors as the length and distribution of different periods of work, the length of the amount of material to be learned, logical versus rote learning, the effect of attention and effort, the occurrence of plateaus and the like. But there is not a single school subject regarding which we have anything more than a fragmentary psychology of the factors and conditions that affect the progress of learning that particular subject. Let us take as an illustration the subject of writing. We know, for example, little or nothing about the actual effect of the many complex factors that enter into the process of learning to write. We do not know whether pupils will make greater progress by emphasizing quality of writing, or speed of writing, or quality and speed simultaneously, or quality and speed alternately each for a given number of days or weeks. We do not know definitely what the optimum length of the writing period is, or what it ought to be for different ages in order to make possible the most rapid progress in relation to the time expended. We do not know whether formal drill in different types of movements such as ovals, vertical and slant lines, or whether practice instead with letters and words is productive of greater progress. We do not definitely know the actual effects of many other factors that might be enumerated, such as arm movements in the air, tracing of letters, visualization of the forms of letters, and so on. To be sure there are beginnings in these directions, but there is hardly a single

problem to which we can give a precise answer with scientific finality. A similar enumeration of the factors and problems in even greater complexity could be made in any other branch of instruction.

The point, therefore, that is to be emphasized in this connection is the necessity of enlisting the coöperation of scientifically spirited educators to take up these problems for solution under school conditions, but controlled according to definite, rigorous procedure.

Accordingly, an experimental procedure will be outlined which can be followed in the solution of a great many problems without interfering seriously with the normal operations of a school. We may designate this plan as the equal squad method. This method has been used in a limited way in various types of investigations, not so much with human beings as with animals and plants in agricultural experiment stations. But it has promise of equally wide and fruitful application in experimental education as well. The general procedure of the equal squad method may be outlined as follows: Suppose we wish to determine whether pupils will make more rapid progress in learning to write when they strive for quality primarily, or for speed primarily, or for quality and speed simultaneously. A grade of thirty pupils could be divided into three squads of ten each. These squads should be made up so as to have approximately equal initial ability. This could be done by making an initial test of their writing ability both as to speed and quality as measured by the number of letters written per minute and as rated by the Thorndike or the Ayres scale. The entire class of thirty pupils could be kept together, receive their instruction at the same time, for the same length of period, and from the same teacher, but each squad would be working for its own particular aim. At regular intervals the progress of the squads should be measured, tabulated and compared. Such an experiment would not interfere with the normal operation of the school or without entailing a great deal of extra work. All that would be required would be a teacher who would appreciate the conditions of a rigorously controlled experiment.

There are scores of problems not only in writing but in all school subjects which could be attacked in precisely the same manner. Further illustrations follow:

In writing: (a) The length of the writing period; whether a 10, 15 or 20 minute period would be the most profitable for the time spent. (b) Formal movement drill versus no such drill.

In reading: (a) Silent versus oral reading. (b) Emphasis on speed, or on comprehension, or on both together.

In spelling: (a) The learning of homonyms together or apart. (b) Column versus contextual spelling. (c) The learning of rules versus omission of rules. (d) The use of misspelling in all written work as a part of the spelling work.

Would it not be wise for every school system, particularly the larger city school systems, to set aside one school or a part of one school as an experiment station for the investigation of the problems of education? I would suggest one school or even a part of one school rather than a wholesale experimentation in several schools or in the entire system, because the wholesale experiment is apt to go beyond the limits of a thoroughly controlled experiment and because the average teacher and the average principal do not appreciate the importance of observing strict scientific conditions. The particular school set aside could be equipped with properly qualified teachers who could be enlisted in experimental work. Such a plan would entail little or no extra cost and ought to be productive of inestimable good. Experiment stations in agriculture have made the science of agriculture and have yielded results of enormous value.

Why has so little been done in the scientific study of educational problems? Chiefly for two reasons. First, we have not had the tools with which to make such experiments possible, and second, educators have lacked initiative and scientific temper to inaugurate and prosecute educational experiments.

Tools in the form of scales and tests are now at hand or are being developed. The scales and tests for measuring educational products will do for education, it is hoped, what the galvanometer has done for electricity, or what the thermometer has done for temperature, or what the balance and the footrule have done for mechanics. The science of dairying was practically impossible until the milk tester was invented.

The chief use of educational measuring devices has consisted thus

far in comparing class with class, school with school, or city with city. The next great problem before us is the task of measuring the effects of the numerous factors and conditions that alter the progress of learning. These details are set down here in the hope that scientifically minded educators may be stimulated in the endeavor to solve these problems.

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